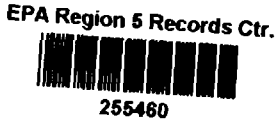

An Interim Study on Volatile Organic Chemical Contamination in Groundwater North of Rockton, Illinois

By

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Table of Contents

Figures, Tables & Appendixes prepared
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Summary

The Illinois Environmental Protection Agency (IEPA) is conducting a special study of groundwater in the vicinity of the Blackhawk Subdivision north of Rockton, (see Figures 1 and 2) as part of a broader study of groundwater contamination in Winnebago County. The purpose of this special study is to identify the extent and source of groundwater contamination affecting private drinking water wells. Private well sampling conducted by the IEPA confirms the presence of volatile organic chemicals (VOC's) in seventeen private drinking water wells. Proposed drinking water standards* have been violated at three of these wells. Two wells exceeded standards for Tetrachloroethylene and for Trans 1,2-Dichloroethylene. Two of these wells also exceeded established standards for 1,1,1-Trichloroethane, 1,1-Dichloroethylene and Trichloroethylene.

Determining the direction of groundwater flow is an essential part of this study. IEPA installed eight monitoring wells and three piezometers to check the flow of groundwater. Water level readings were taken from these monitoring points and from existing wells on the property of the Beloit Corporation. Water level readings consistently showed a predominant southerly flow in the shallow aquifer.

VOC's can be found in a variety of hobby and household applications. IEPA staff looked for signs of VOC use in homes and garages and discussed past use of products containing VOC's with residents of Blackhawk Subdivision. Contamination from a residential source appears unlikely. Although contamination at one well may be due to careless housekeeping, contamination at other wells cannot be attributed to this source.

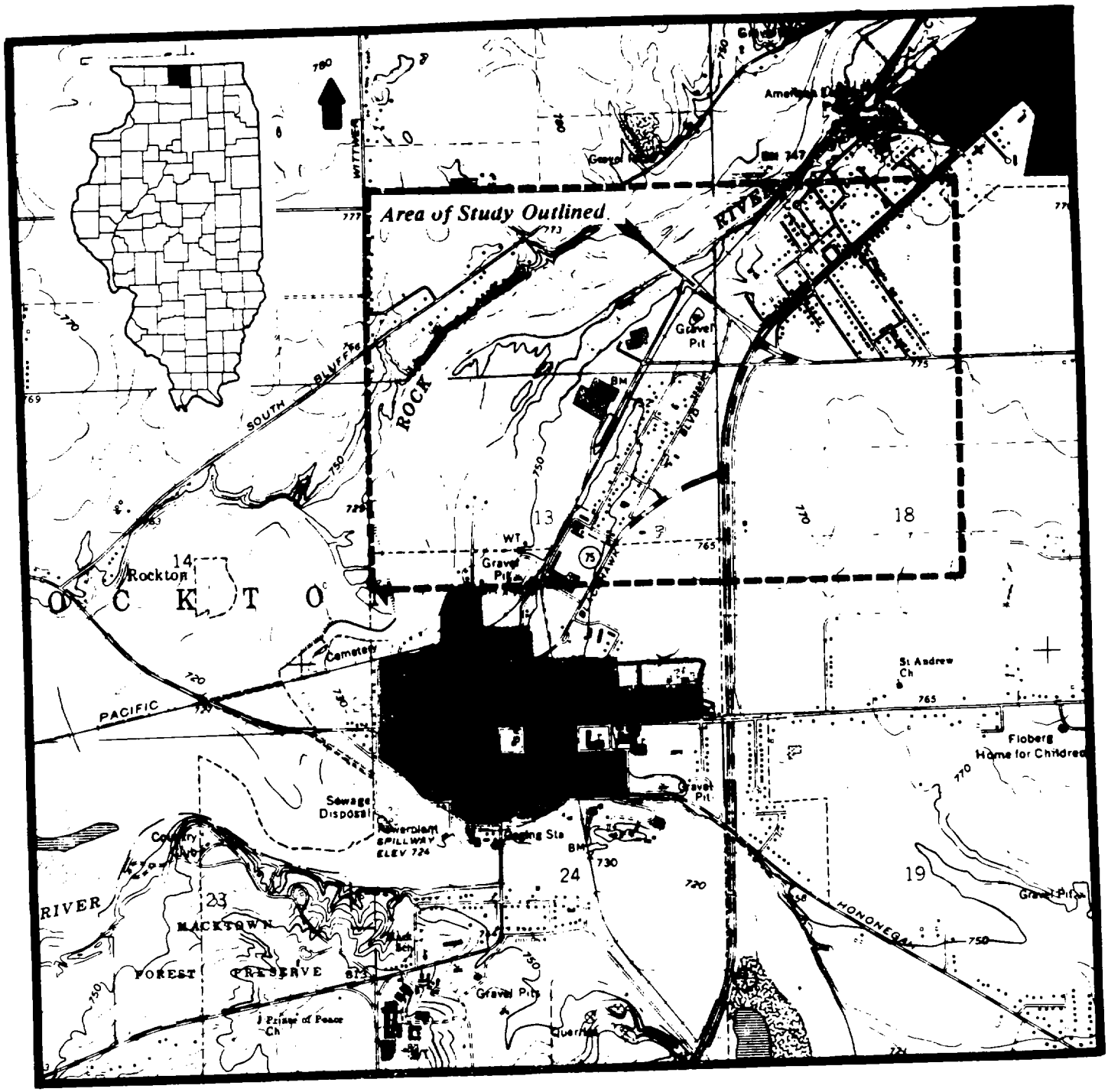
* The United States Environmental Protection Agency is in the process of proposing drinking water standards for some volatile organic chemicals. These proposed standards are based on risk assessments of contracting health problems from exposure to contaminated drinking water.

Concurrently, IEPA identified four potential sources of contamination in the immediate vicinity of the Blackhawk Subdivision: Safe-T-Way, Taylor Freezer, United Recovery/Soterion, and the Beloit Corporation. Three of these suspected sources, Safe-T-Way, Taylor Freezer and United Recovery/Soterion, are downgradient of the contaminated wells. Safe-T-Way does not use hazardous substances that were detected in monitoring wells and drinking water wells by IEPA. Taylor Freezer does not use the two chemicals of most concern, Tetrachloroethylene and 1,1-Dichloroethylene.

The Beloit Corporation is located upgradient of the effected drinking water wells and has handled or disposed of volatile organic chemicals found in drinking water wells. These same chemicals have also appeared in three monitoring wells on the Beloit Corporation property. The IEPA monitoring well upgradient of the Beloit Corporation showed no contamination. All of the evidence gathered to date indicates the Beloit Corporation property as the primary and perhaps sole source of volatile organic chemical contamination found in residential wells. The exact location or locations of these chemicals on the Beloit Corporation property is yet to be determined.

Following the release of a preliminary draft of this report, Warzyn Engineering Incorporated performed an investigation for the Beloit Corporation. Their investigation was designed to evaluate a portion of the Beloit Corporation property and the United Recovery/Soterion site. A copy of their report was reviewed by the IEPA and evaluated before preparing the final draft of this report.

The Beloit Corporation property is also being scored as part of the process for identifying sites that should be included in the federal Superfund program.



Local Topographic Setting of the City of Rockton, Winnebago County, Illinois

South Beloit Quadrangle, 7.5 minute series, 1976
U.S. Department of the Interior, Geological Survey.

Figure: 1

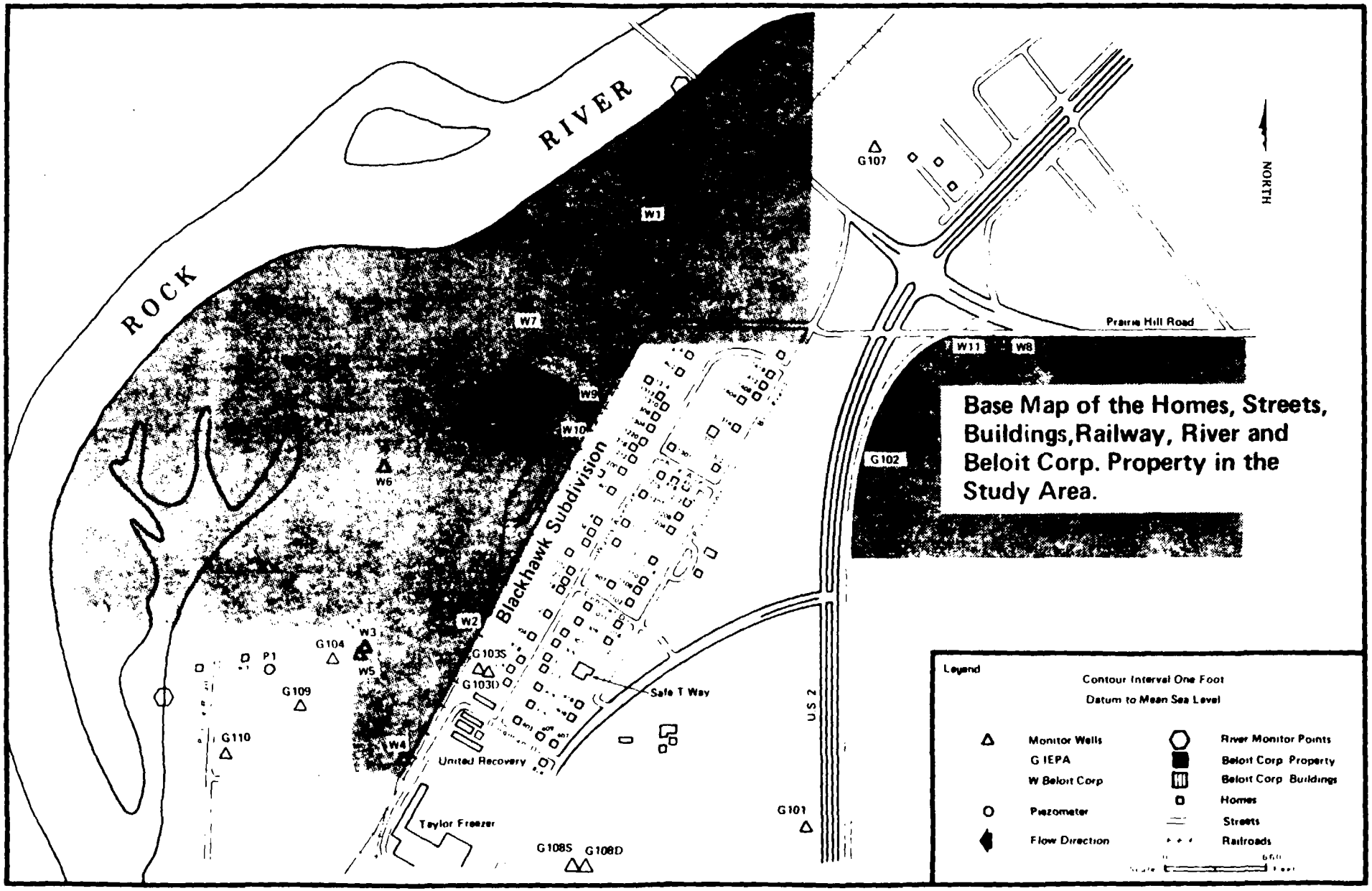

ROCK RIVER
W1
W7
W9
W10
W6
W2
W3
W5
W4
W11
W8
G102
G107
G104
G103S
G103D
G109
G110
G101
G108S
G108D
P1
Blackhawk Subdivision
Safe T Way
United Recovery
Taylor Freezer
US 2
Prairie Hill Road
NORTH
Base Map of the Homes, Streets, Buildings, Railway, River and Beloit Corp. Property in the Study Area.
Legend
Contour Interval One Foot
Datum to Mean Sea Level
Monitor Wells
G IEPA
W Beloit Corp
Piezometer
Flow Direction
River Monitor Points
Beloit Corp Property
Beloit Corp Buildings
Homes
Streets
Railroads

Figure: 2

Introduction

Chemical contamination of drinking water has been found at several locations in Winnebago County during the past two years. This contamination has occurred in both private and public drinking water wells. Citizen concern about drinking water contamination near Rockton led to the release of money from the Environmental Protection Trust Fund to the Illinois Environmental Protection Agency (IEPA) to study chemical contamination of drinking water in Winnebago County.

Seventeen private drinking water wells north of Rockton, Illinois in Blackhawk Subdivision have been tested and found to contain detectable concentrations of volatile organic chemicals (VOC's). These wells are on both the north and south side of this subdivision. Three of the households, along Watts Ave. have levels in excess of the maximum contaminant levels (MCL's) proposed by the United States Environmental Protection Agency (USEPA).

Since the 1940's industry has increased the production and use of VOC's. Uses are numerous and include: solvents for many organic substances, additives in metal cutting oils, cleaners and degreasers of metal parts, and textile dry cleaning. These chemicals are synthetic and have no natural sources.

Geologic Setting

The area is located just north of the town of Rockton, Illinois, in the N 1/2 of section 13 and the S 1/2 of Section 12, T.46N., R.1E. in Winnebago County. Winnebago County is near the center along the northern border of the State. The area lies within the physiographic subsection called the Rock River Hill Country of the Central Lowland Province. Topographically the uplands are broad and gently rolling, rising 100 to 200 feet above both sides of the wide alluvial valleys of the Pecatonica and Rock Rivers. The Village of Rockton lies upon the alluvial valley wnere these two major rivers join.

The upper bedrock is the Galena-Platteville Dolomite of Ordovician age. These rocks range in thickness from zero, where it has been eroded away, to greater than 350 feet. Thickness and characteristics of geologic deposits in Winnebago County is illustrated in Figure 3. Before glaciation, this area was effected by a long period of erosion. Much of the younger rock was carried away leaving a dissected topography, characterized by deeply eroded valleys that in some areas cut through the Galena-Platteville into the underlying formations of the Glenwood and St. Peter (See Figure 4). In this county the major bedrock valleys are the Rock and it's two main tributaries, the Pecatonica and Sugar Bedrock Valleys (See Figure 5).

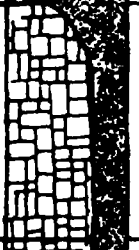
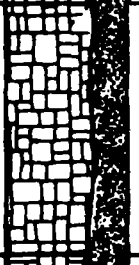
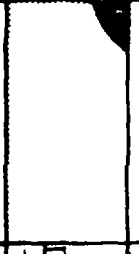
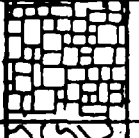
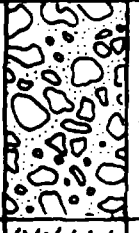
Rockton lies directly over a broad lowland where the buried Pecatonica Bedrock Valley joins the buried Rock Valley. The present Pecatonica and Rock Rivers almost parallel their underlying bedrock valleys. However, the present rivers are much smaller in comparison to their present broad river valleys.

During the Pleistocene age continental ice sheets advanced and retreated several times through this area. This created a unique environment where both ice and water played important roles in the erosion, transportation, and deposition of sediment. In the bedrock valleys thick deposits of sand and gravel outwash called valley trains, were deposited by meltwaters flowing from the glaciers. The depths of selected area wells in relation to these glacial deposits and bedrock valleys is illustrated in Figure 6.

Interbedded within the outwash are finer grained lacustrine (lake) deposits. Quickly accumulating deposits of sediment in the major valley from the glacial meltwater would often choke or dam the tributary valley. Behind these natural dams, in the tributary valleys, lakes would develop. The lakes, being fed by glacial meltwaters, would grow until the dam could no longer hold

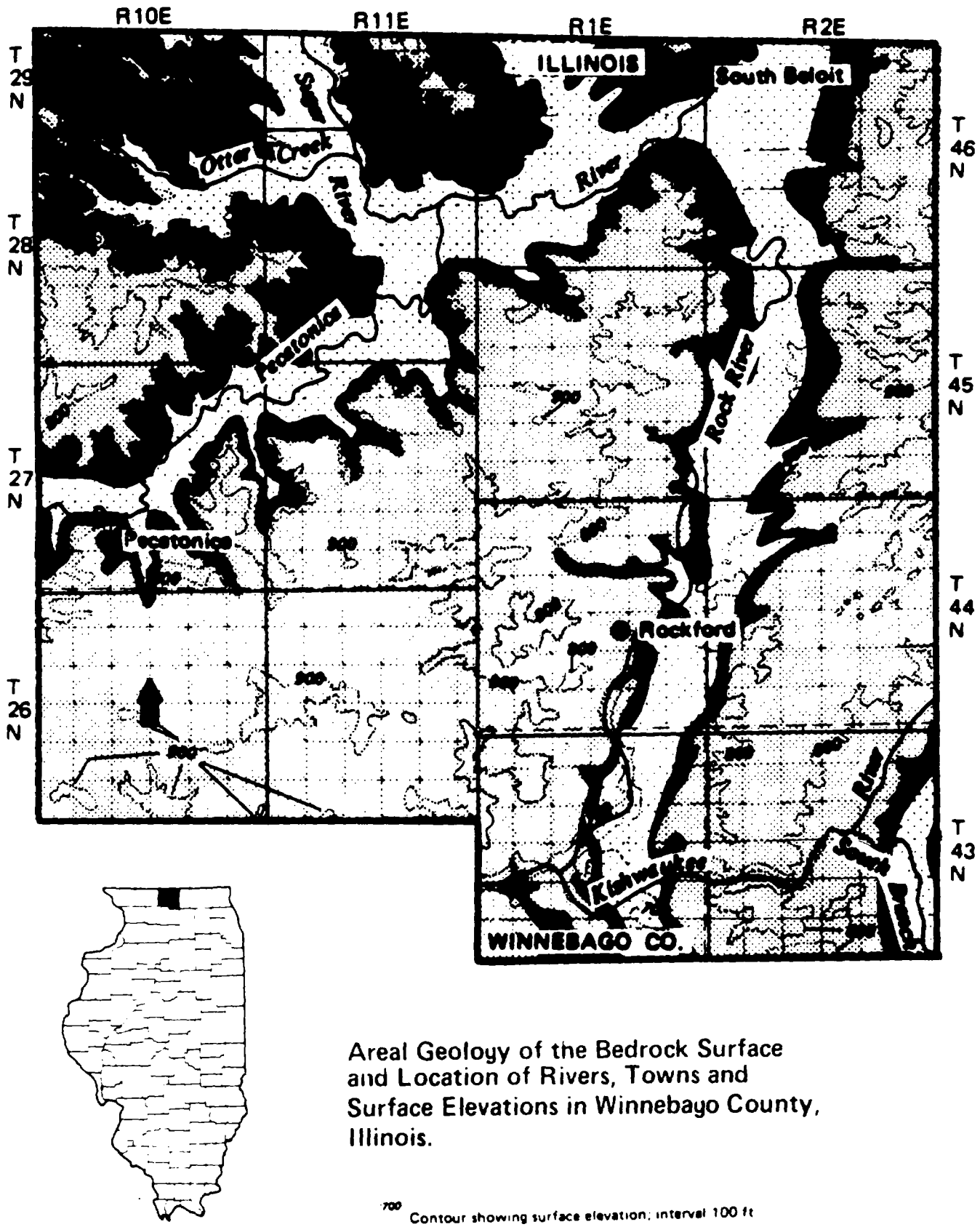
back the water. At this point, the dam would breach and large quantities of water would flood the major valleys cutting through the previous fine grain deposits leaving the coarser outwash.

After the retreat of the last glacier, modern soil began to develop and the present day drainage system emerged. These present day river deposits, called the Cahokia Alluvium, are characteristically poorly sorted and range in grain size from fine clays to coarse sands and gravels.

SYSTEM	GROUP/FORMATION	GRAPHIC	THICKNESS	DESCRIPTION
Quaternary			0 – 300'	Unconsolidated deposits associated with glacial enviroments including glacial tills, outwash, ice contact and lake deposits with more recent deposits of loess, peat and alluvium
Ordovician	Galena		250'	Dolomite, medium - to coarse-grained, cherty, gray, aquifer
	Platteville		100'	Dolomite, finely crystalline, dense, cherty, sandy, brown, aquifer
	Ancell: Glenwood Fm.		5 – 60'	Dolomite, sandstone, shale
	Ancell: St. Peter Fm.		200' – 400'	Sandstone, fine- to coarse-grained, silty and argillaceous, high % well-rounded quartz, white to red, aquifer.
Cambrian	Potosi Fm.		50' – 100'	Dolomite, finely crystalline, variable amounts of clay, silt, sand
	Franconia Fm.		50' – 100'	Sandstone, interbedded siltstone and shale and some dolomite.
	Ironton/Galesville Fm.		75' – 170'	Sandstone, clean, fine- to medium-grained, well-sorted and sandstone, dolomitic, coarse grained, aquifer
	Eau Claire Fm.		350' – 450'	Dolomite, tan to gray and argillaceous sandstone
	Mt. Simon Fm.		1,000' – 1,600'	Sandstone, poorly sorted, very fine to very coarse-grained, white to red, silty, friable
Precambrian				Crystalline Granite, no aquifers in Illinois.

Geologic Column for Winnebago County, Illinois.

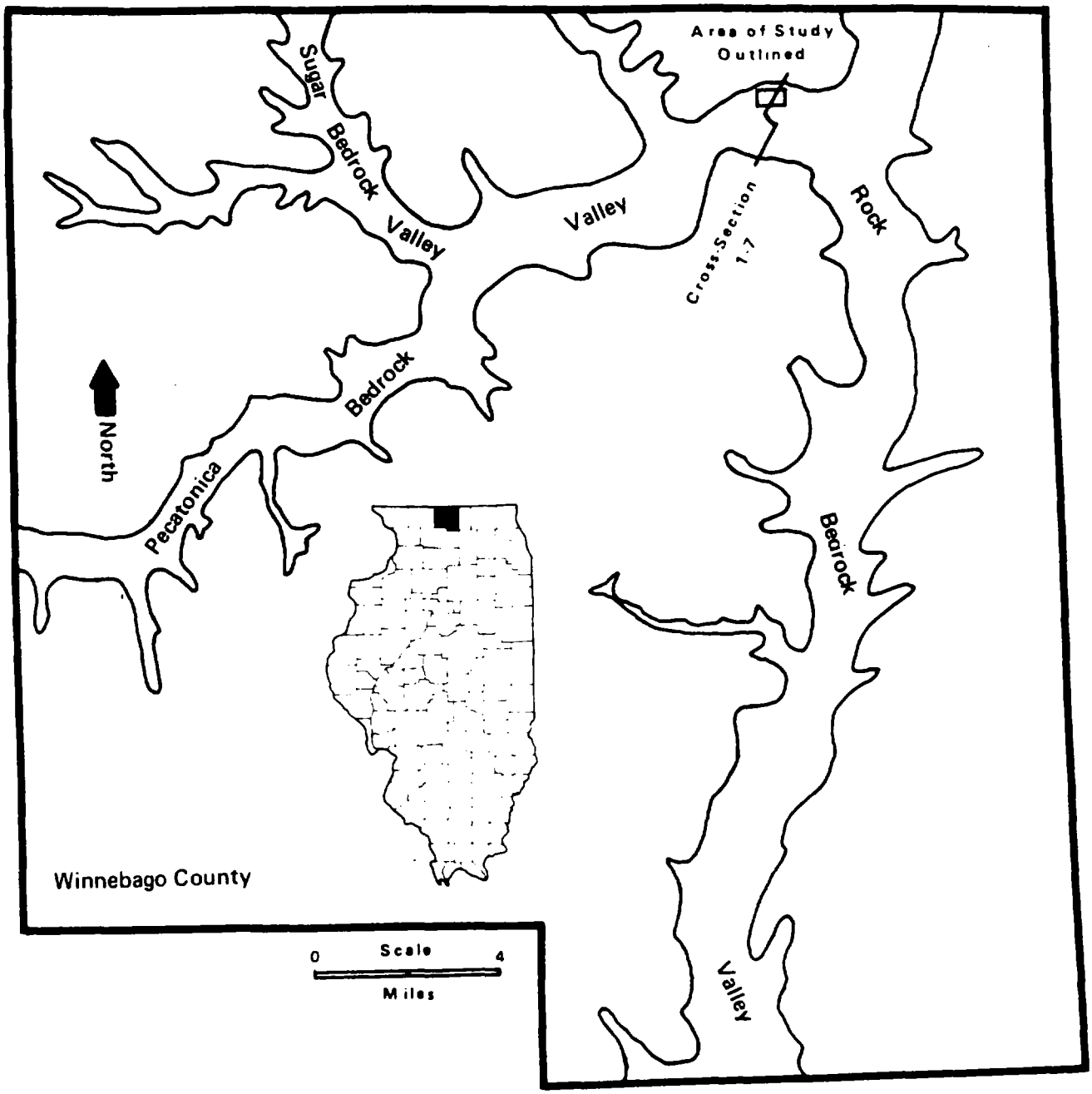
Figure. 3



Areal Geology of the Bedrock Surface and Location of Rivers, Towns and Surface Elevations in Winnebago County, Illinois.

Modified from Berg, et.al. 1984

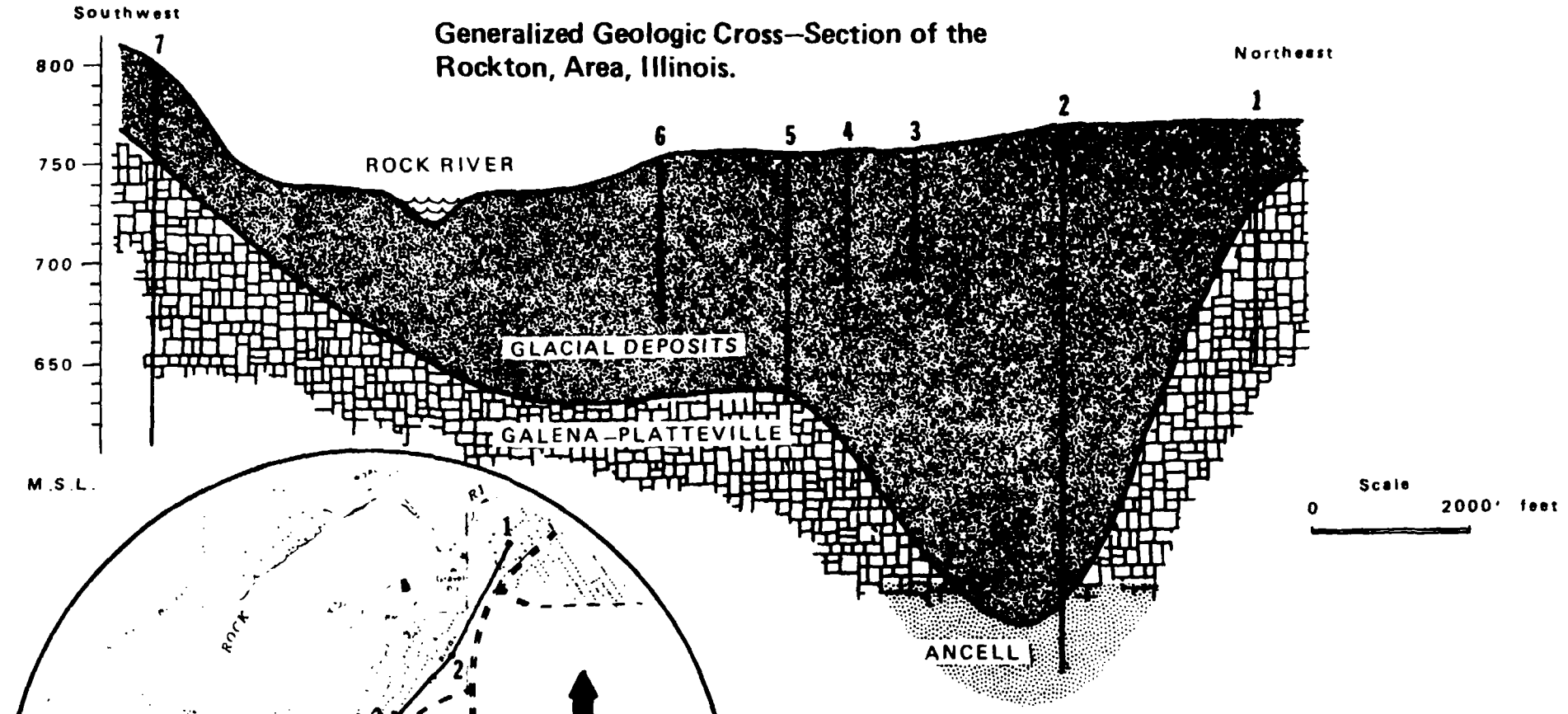
Figure: 4



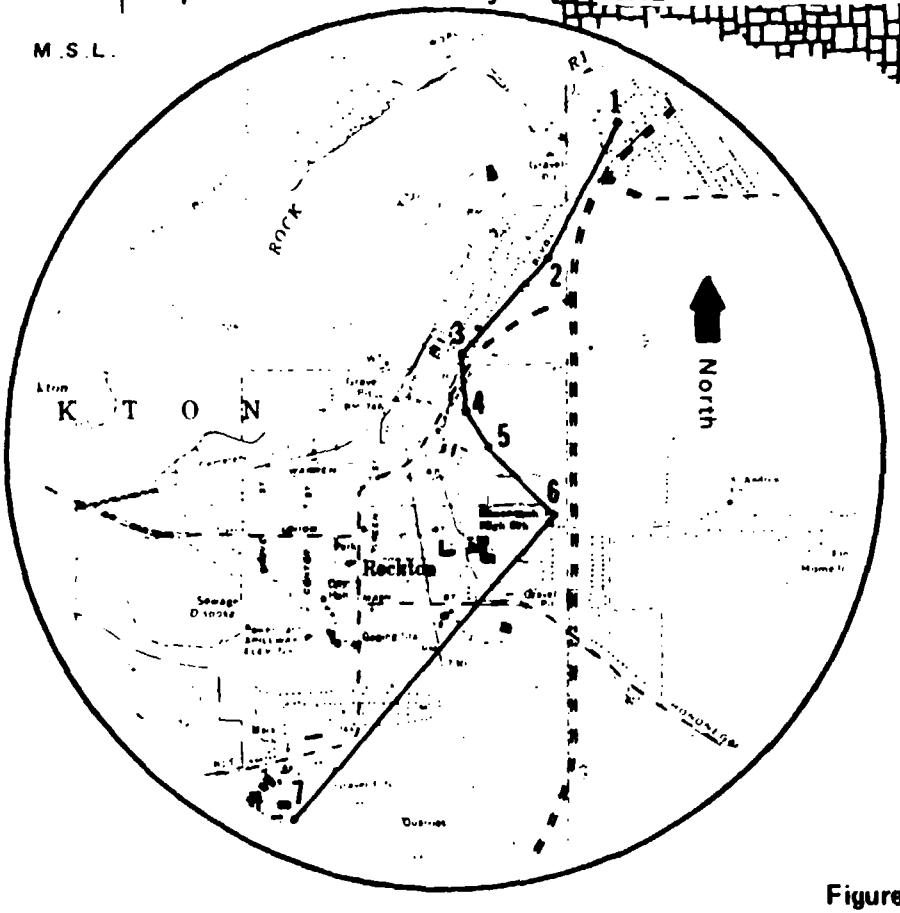
Location of Study Area and Cross-Section 1-7 , and Buried Bedrock Valleys in Winnebago,County, Illinois.

Source: Berg, et.al. 1984, Illinois State Geological Survey, Circular 531.

Figure: 5



Generalized Geologic Cross–Section of the Rockton, Area, Illinois.



Wells with Illinois Department of Public Health Permit Dates.

1 *Amwood Homes, November 6, 1981*
2 *Rockton Area Community Health Center, June 7, 1978*
3 *409 Dingman, February 25, 1977*
4 *G108D, IEPA Monitor Well, April 1, 1987*
5 *City of Rockton Well (1), July , 1956*
6 *Rockton Township Well (5), April 26, 1977*
7 *Village of Rockton Well (6), January 20, 1969*

Figure: 6

Site Hydrogeology

The movement of groundwater in this area is quite complex due to the thickness and wide variety of sediments within the bedrock valley. In general groundwater moves from the uplands into the valleys ultimately discharging into the river systems. Groundwater from the surrounding bedrock aquifers of the Galena-Platteville and Glenwood-St. Peter discharges into the valley fill. Within the valleys groundwater can be found 10 to 40 feet from the surface. The sand and gravel deposits within these valleys are excellent sources of water, providing ample supplies for private, municipal, and industrial use. In fact, water is so plentiful that the town of Rockton is able to provide its community an unlimited quantity of water at one set price.

Within the valleys there is very little runoff due to flatness of the topography and the high porosities and hydraulic conductivities (rate of groundwater flow) of these deposits. Rainfall which is not evaporated or transpired by vegetation will seep into the ground rapidly replenishing this major sand and gravel aquifer. Because of these characteristics, the State Geological Survey has designated this area as having a high potential for groundwater contamination (ISGS Circular 531, Berg et al, 1984).

The shallow groundwater, within the valley fill, is under water table conditions except where the finer grained deposits rest on top of the more permeable outwash. When this occurs, the groundwater is under semi confined or leaky artesian conditions. Hydraulic conductivities of the valley fill material can vary greatly, but roughly ranges between 10 - 2 cm/sec in the sands and gravels to 10 - 7 cm/sec in the silts and clays. This roughly ranges from less then an inch to tens of feet per day. The hydraulic gradient (slope) of the water table can be obtained by measuring the water levels in wells screened at or near the water table. This gradient, which indicates the

direction of flow of groundwater in the upper zone of saturation, can change depending upon the amount water recharging the area. From the first measurements taken on April 29, 1986, to the last measurements taken in July 23, 1987, the water table has progressively dropped an average of 2 1/2 feet in all the monitor wells (See Table 1). The gradient has stayed consistent with flow mainly toward the south and southwest (See Appendix A). If the hydraulic conductivity is 10 - 2cm/sec (28 ft/day) and the hydraulic gradient is calculated between G102 and G101 as 0.0021 ft/ft and assuming an effective porosity of 25%, the velocity of the groundwater in the coarser deposits would be .024 ft/day (a movement of a quarter of a foot per day).

		Dates	4/29/86	5/12/86	6/3/86	6/17/86	7/16/86	3/19/87	4/2/87	6/22/87	7/23/87
Beloit Corp. Wells	W-1		729.90	729.60	729.17	728.88	729.14				727.53
	W-2		727.75	727.41	727.36	726.97	726.42				724.15
	W-3		725.49	725.18	724.84	724.46	724.03				722.69
	W-4		724.45	724.36	724.06	723.82	723.25				721.68
	W-5		725.39	725.08	724.69	724.35	724.08				722.56
	W-6		726.89	726.44	726.10	725.70	725.69				724.43
	W-7		730.89	730.60	730.55	730.17	729.93				727.03
	W-8		731.37	731.27	731.17	731.07	730.78				729.26
	W-9		731.34	730.94	730.76	730.32	729.78				726.46
	W-10		731.30	730.94	730.76	730.34	729.76				726.45
	W-11		731.69	731.58	731.47	731.37	731.09				729.56
IEPA Wells	P-1				724.48	724.10	724.05	723.30	723.50	723.07	722.59
	G101		725.55	725.40	725.12	725.96	724.43	723.37	723.20	723.17	722.77
	G102		730.89	730.76	730.62	730.47	730.16	728.94	728.75	728.71	728.33
	G103S				727.51	727.02	726.33	724.43	724.67	725.17	724.02
	G103D							724.35	724.54	725.00	723.93
	G104				724.71	724.34	724.07	723.02	723.26	723.26	722.66
	G107						730.62	729.52	729.40	729.50	729.09
	G108S							720.46	720.41	720.77	720.18
	G108D								720.44	720.79	720.23
	G109							722.78	723.06		722.26
	G110							722.27	722.49		721.64
Rock River at Trulls Residence.					725.28	725.10	725.70	725.63	725.49	725.21	725.08
Rock River at Beloit Corp.				726.09	725.68	725.68	726.30				

Ground Water Elevations to Mean Sea Level For The Shallow Glacial Aquifer North of Rockton, Illinois.

Table: 1

Evaluation of Potential Contamination Sources

An assessment of residences in the Blackhawk Subdivision was conducted by the IEPA looking for sources of VOC's. Solvents, degreasers, spot removers and some products used in certain hobbies and crafts contain VOC's. Observations were made in homes including basements, garages, and yards to detect products containing VOC's as well as to determine useage and disposal of these products. Interviews were also conducted to complete this assessment.

Residential use of products containing VOC's is low, and virtually nonexistent, in Blackhawk Subdivision. The residents at all the private wells tested by the IEPA were asked if they had ever used compounds in their septic systems or as a disinfectant in their drinking water wells. All responded no, with many adding that they did not put any additives in their septic system because it could damage the system.

Safe-T-Way is one block east of Watts Avenue at 918 North Blackhawk Boulevard and makes explosion proof gas cans. As a part of the manufacturing process, the cans are rinsed with xylene which is then reused. The only waste discarded is paint sludge and this is collected twice a year and hauled to Wisconsin for disposal. The contaminants found in the groundwater are not used at this facility and therefore this company is not considered a source of the contamination.

Taylor Freezer, located south of the contaminated wells, makes soft drink and soft ice cream machines. This company has an air pollution control permit from the IEPA for their spray painting and degreasing operations. Trichloroethylene and methylene chloride waste are generated on site in small quantities (less than 300 gallons per month). This waste is properly stored less than 90 days before being transported off site by licensed haulers. This facility is hydraulically downgradient of the contaminated wells and is not considered the source of the contamination.

Soterion/United Recovery, located at the south end of Watts Avenue, reclaimed metals from high speed cuttings and cooling oil waste from mid 1979 to January 1984. The oil was sold or used on site as fuel, and the fine metal powder was sold to the steel industry for use as an alloy. Two types of waste resulting from the recycling process included a fine powder residue and an oily waste water. IEPA investigations noted oily soil, puddles and piles of waste powder at various locations on the plant property. The site owner claimed to have not used any chlorinated organic solvents but rather only inorganic powders and phosphate surfactants. A water supply well and an abandoned well on the Soterion/United Recovery property was tested by the IEPA in 1982. No VOC's were detected in either well. In 1984 the property was sold, cleaned, and is no longer used for waste recycling. This facility is also hydraulically downgradient of the effected drinking water wells.

Beloit Corporation is located north and west of Watts Avenue at 1165 Prairie Hill Road. This facility manufacturers machines that produce layered paper products from paper pulp. In addition to the manufacturing plant the Research and Development (R and D) facility designs and demonstrates the paper making machines. At the R and D facility wastewater from the pulp extraction is generated averaging 100,000 gallons per day three to four days a week. This wastewater was piped to three unlined surface lagoons northwest of the R and D facility. All three lagoons are fourteen feet deep with a total capacity of 4.16 million gallons. Periodically the settled paper fiber was removed from the lagoons using a drag line. Prior to 1981 little is known about how or where this paper fiber was disposed. However, a March 1980 IEPA inspection of the non-permitted Wilson and Shipler dump noted disposal of a material which Mr. Shipler stated was paper pulp waste from the Beloit

Corporation research plant. A sample of this waste contained 230 ppb Aliphatic Hydrocarbons and was physically described as a watery frothy liquid, light blue in color, with a light brown surface scum.

On September or October of 1981, Beloit Corporation contracted Soil Builders to agitate the three lagoons and inject the slurry into the soil subsurface. Approximately 220,000 gallons of slurry was spread over a 10 acre area at the southern end of the Blackhawk facility property. This land application was done without a permit until November 1983 when a permit was issued by IEPA (#1983-SA-2751). Shortly after the issuance of this permit Beloit Corporation ceased land application due to complaints from local citizens. Subsequently, the sludge was either stored in waste piles near the lagoons or disposed off site.

Beloit Corporation analyzed a sample of the wastewater before it entered the lagoons in May of 1983 and found 6.3 ppb Tetrachloroethylene. This concentration was assumed to be the average amount discharged over a 24 hour period. Bottom sludge samples of the lagoons, taken by the IEPA in 1983, contained 1,1,1-Trichloroethane (9 and 10 ppb), Trichloroethylene (5 and 6 ppb), Tetrachloroethylene (5 and 10 ppb), Dichloroethane (30 ppb), Dichloroethylene (5 ppb), Ethylbenzene (5 ppb) and Aliphatic Hydrocarbons (270 ppb).

Additional samples of the liquid in the lagoons and the sludge taken by the IEPA and Beloit Corporation in 1983 and 1984 continued to have varying amounts (ppb range) of VOC's. Analysis of the paper fiber pile by Beloit Corporation in 1983 also contained cyanide. During the summer of 1983, Beloit Corporation reportedly stopped using any chlorinated solvents and switched to using Di-N-Octyl Phthalate.

Groundwater monitor wells were installed on the Beloit Corporation property in 1983 and 1984. W1, W2 and W3 were installed as a part of Beloit Corporation's groundwater monitoring IEPA permit requirement (#1983-SA-2751). W1 was considered by Beloit as a background well, however, current groundwater flow data shows this well to be downgradient of the R and D facility. Semi-annual chemical analyses of these three wells has been done since February of 1984. The following chemicals have been detected: Trichloroethylene (6 to 142 ppb), 1,1,1-Trichloroethane (5 to 512 ppb), Tetrachloroethylene (6 to 18 ppb), 1,1,1-Dichloroethane (trace to 18 ppb). On November of 1985 W-2 also contained 17.7 ppb Di-N-Octyl Phthalate.

In addition to the lagoons, waste piles, and the land spreading of wastes on site, the Beloit Corporation has landfilled bag house dust and waste foundry sand. This waste was disposed of on site for six months.

The Beloit Corporation R and D facility also has two 50,000 gallon open-top steel above ground tanks. These tanks are located outdoors between the R and D facility and the three lagoons. These tanks were used as a reservoir for the fiber slurry used in paper making. Waste from these tanks was discharged to the lagoons.

Scrap metals, residual coolants and cutting oil waste products are also produced from the various milling, cutting and welding operations at this facility. Approximately 935,000 pounds of this type of waste is produced annually. This is sold to scrap metal dealers for recycling. Small quantities of coolants and cutting oils accumulate on the asphalt storage area. This is allowed to runoff and seep into the ground at the facility.

Waste paint and solvent mixtures from the paint booth, both filters, and small quantities of spent degreasing solvents and waste acid is also generated at this site. These wastes are all currently being properly disposed of off site.

On October 2, 1985, IEPA investigated barrels dumped on the Beloit Corporation property. Four 55 gallon barrels were found with their contents leaking into the soil. Samples of the spillage contained high levels of methylene chloride (20 ppm), carbon tetrachloride (130 ppm), Trichloroethane (10 ppm), 1,1,1-Trichloroethane (20 ppm), Toluene (45,000 ppm) Ethylbenzene (30,000 ppm) and Zylenes (120,000 ppm). Beloit Corporation was requested to clean up the drums and spillage.

Method of Study and Monitor Well Plan

Before the installation of any new monitor wells, PVC wells at Beloit Corporation and existing IEPA PVC wells were used to obtain information on groundwater flow. Based on this information and historical data from IEPA files, additional well locations were determined.

The entire study was done using a CME 55 drill rig with 3 1/4 inch hollow stem augers. Due to the lack of cohesion of the sands and gravels, sampling with any type of sampler was not attempted. Instead a visual geologic description was made from auger cuttings.

Eleven new wells were installed in the study area. Three of the wells were installed to obtain water levels only, using glue jointed PVC casing with hack sawed screens. The remaining wells were installed to monitor groundwater chemistry. Type 304 stainless steel screen and casing was used to minimize the chemical effects of the casing material on the groundwater sample.

A steel knock-out plate, placed in the cutting head of the lead auger was used to prevent sands and gravels from coming up inside the hollow stem augers. Upon reaching the desired depth, the well casing was assembled and placed inside the augers. The weight of the well casing would knock out the steel plate, and the augers were removed allowing the native sands and gravels to cave in around the casing. The native material would cave in to the top of the zone of saturation. Above this zone, an expanding cement grout was placed in the annular space up to ground level.

Monitor well G107 was placed hydrologically upgradient to obtain background water quality information. The remaining wells were installed down gradient of G107 in the area of the effected homes.

The clustered wells (G103S, G103D and G108S, G108D) were installed to detect sinking VOC's and measure vertical groundwater gradients. The shallow wells (G103S and G108S) were screened at the top of the zone of saturation. (water table height) The deep wells (G103D and G108D) were screened at 20 feet and 25 feet respectively below their adjacent shallow wells. Wells G104, G107, G109 and G110 were all screened at the top of the zone of saturation.

All drilling equipment and well casing materials were cleaned with an acetone and deionized water 50/50 mixture, and then sprayed with high pressure hot water. This was done to remove cutting oils and grease and to avoid contamination of the monitor wells. All water was chemically tested for impurities before use.

Chemical Analyses and Nature of the Contaminants

A set of groundwater samples was taken from each of the stainless steel monitor wells for VOC analyses. Samples were also taken from most of the private wells in Blackhawk Subdivision and N. Prairie Road (See Appendix B for

sample location and results). All private drinking water wells with detectable VOC concentrations were sampled twice, and some were sampled three times. All of the samples were collected according to IEPA methods and procedures and were analyzed at the IEPA organic laboratory in Springfield for VOC's only.

Sixteen of fifty-five private wells sampled contained varying levels of VOC's. Three of the sixteen wells had levels in excess of the USEPA maximum contaminant levels (MCLs). The Illinois Department of Public Health and the IEPA's Division of Public Water Supplies reviewed these results and agreed that residents at 910, 918 and 1314 Watts Avenue, should seek an alternate source of drinking water. (MCLs and highest concentrations detected during this study are listed in Appendix C.)

Monitor wells G104 and G109 both showed detectable VOC concentrations. Results from these wells show that groundwate contamination is migrating from the Beloit Corporation's property.

A review of sample results must be accompanied by an understanding of how contaminants move through the subsurface. Various physical, chemical and biological processes affect movement through the subsurface. Comparing what is known about these processes with the location of sample results will help in determining the source or sources of contamination.

Most of these contaminants have a relatively low solubility in water and tend to migrate as discrete globules with small portions dissolving in the groundwater. The movement of these types of contaminants through groundwater is mainly governed by the chemicals density and viscosity. There is a tendency for these types of contaminants to remain within the open spaces between the soil particles and dissolve slowly over months and sometimes even

for a year or more, into the groundwater. This means that large quantities of these contaminants could still be in the subsurface slowly dissolving and flushing into the groundwater.

The difference in densities between these contaminants can be seen when comparing the chemical analyses. In general, contaminants that are less dense then water float spreading out over the water table, where as, contaminants that are denser than water sink. These so called "sinkers" can have a very dominant vertical movement through the subsurface even in horizontally flowing aquifers. (Mackay, D.M.; Roberts P.V.; Cherry, J.A. Environ. Sci Technol., Vol. 19, No. 5, 1985; pp. 384-392) This effect is clearly evident when comparing chemical analyses between monitor wells amd the private wells in this area. Most of the IEPA monitor wells are screened at the water table. Private drinking water wells are screened much deeper in the aquifer, usually greater then 60 feet. The monitor wells detected greater quantities of 1,1-Dichloroethane then the private wells. 1,1-Dichloroethane has a density of 1.174 and tends to float on the water table. In contrast, Tetrachloroethylene with a density of 1.626 sinks, and is detected in higher concentrations in the private wells then in the monitor wells. (For a comparison of chemical densities, see Appendix C.)

The varying hydraulic conductivities of the heterogeneous glacial deposits will also have an effect on the migration of these contaminants. The groundwater flow will be slower through the clayey deposits and faster through the coarser sands and gravels with the contaminants following the path having the higher rate of flow. This explains the chemical analyses results of IEPA monitor wells G103S and G103D. Neither of these wells detected any VOCs even though private wells fifty feet away had high levels of VOCs present. Both of these monitor wells have a very slow recharge and were screened in a zone having a greater silt and clay content.

Conclusion

One private drinking water well may have become contaminated, at least in part, from careless housekeeping. However, drinking water wells at various depths in the immediate vicinity of this well do not show any detectable concentrations of VOC's. Upgradient of this well, detectable concentrations of VOC's have been identified. Therefore, if careless housekeeping is the cause of contamination of this well, it does not account for VOC contamination found at other drinking water wells particularly since higher concentrations were detected elsewhere in the subdivision.

The investigation has identified the probable source of VOC contamination effecting private drinking water wells in Blackhawk Subdivision. More work is necessary to determine if there is one or more locations on the Beloit Corporation property which are contributing to the VOC contamination in groundwater. Additional work must be completed before a permanent remedy for this problem can be selected.

VOC contamination near the southwestern boundary of the Beloit Corporation property is close to two private drinking water wells owned by Dr. & Mrs. Ezra Trull. Although VOC's were not detected in these two wells, additional samples should be taken following a period of heavy and prolonged precipitation to determine the full extent of VOC movement in this area and in Blackhawk Subdivisiom.

Two monitoring wells were also installed southeast of Blackhawk Subdivision to determine if contaminated groundwater is migrating towards newer housing developments and Rockton Municipal Well #5. One set of samples from these monitoring wells showed no VOC contamination.

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IEPA file: Winnebago County general
IEPA file: Rockton/Beloit Recovery
IEPA file: S. Rockton/United Recovery
IEPA file: Rockton/Watts Ave. Groundwater Contamination

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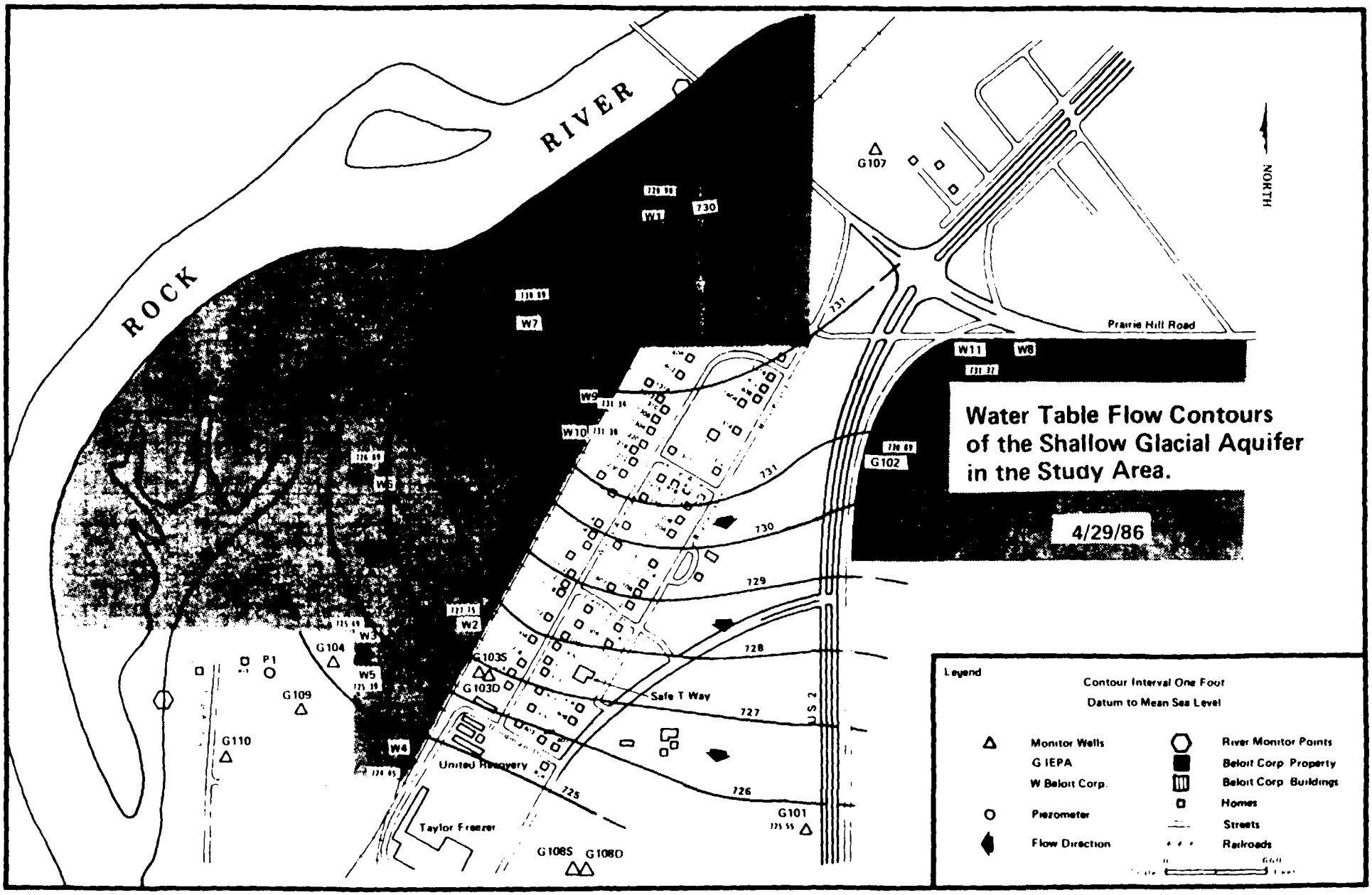
SO:GM:st:3676g,spl-26

APPENDIX A

WATER TABLE CONTOUR MAPS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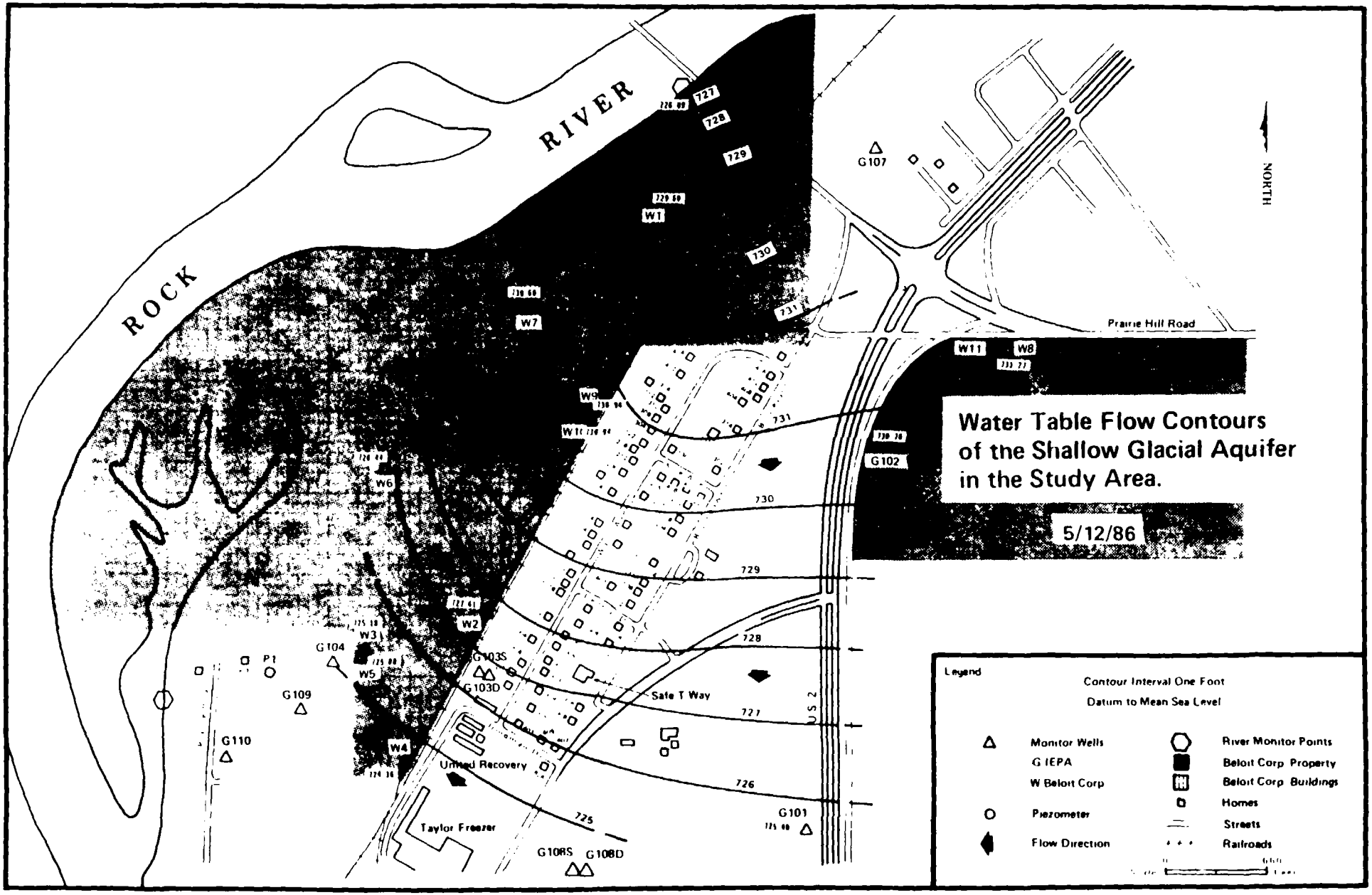
Water Table Flow Contours
of the Shallow Glacial Aquifer
in tne Study Area.
4/29/86
Legend
Contour Interval One Foot
Datum to Mean Sea Level
Monitor Wells
G IEPA
W Beloit Corp.
Piezometer
Flow Direction
River Monitor Points
Beloit Corp Property
Beloit Corp Buildings
Homes
Streets
Railroads

Appendix A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Water Table Flow Contours of the Shallow Glacial Aquifer in the Study Area.
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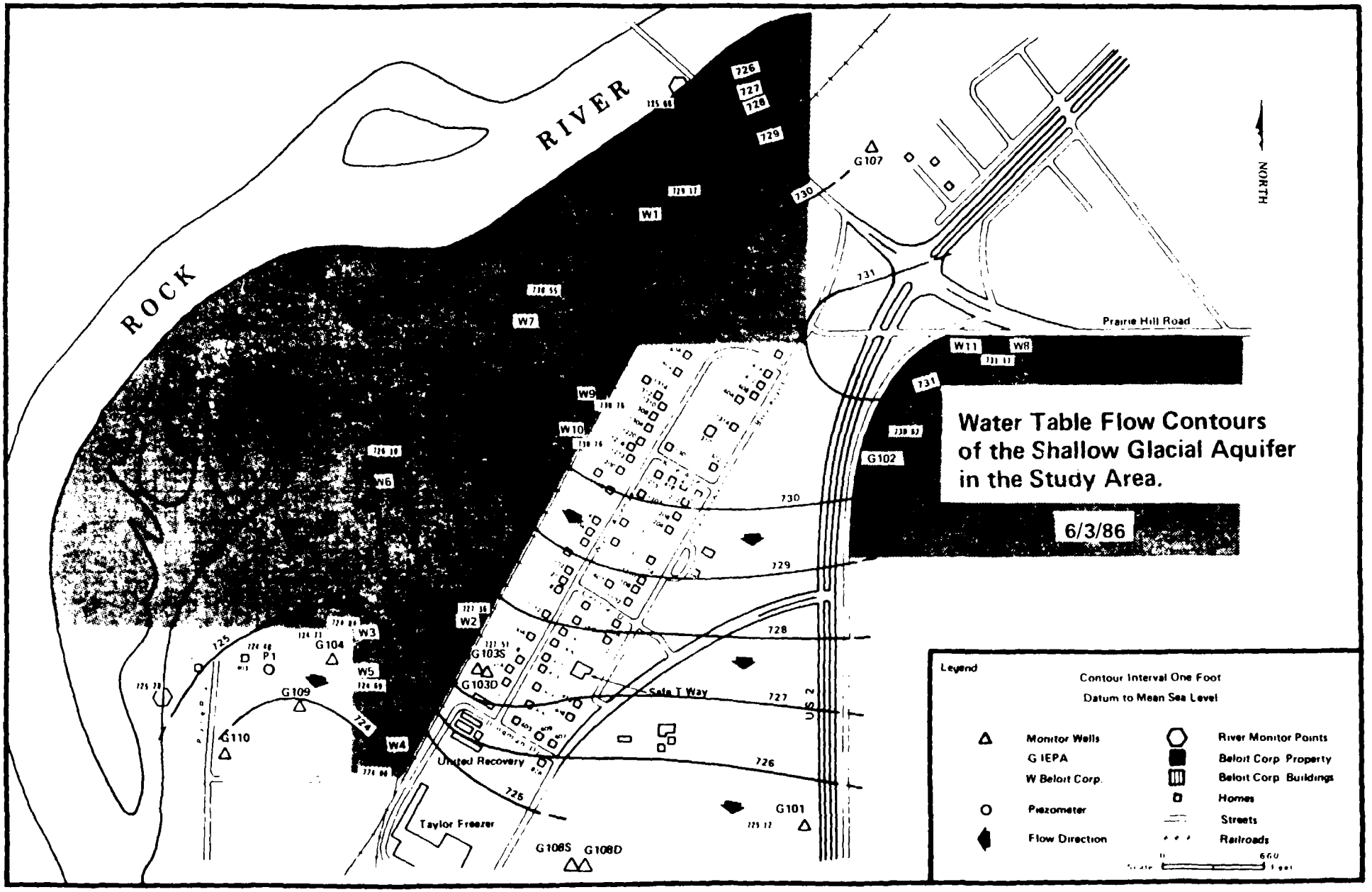
Appendix A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Monitor Wells
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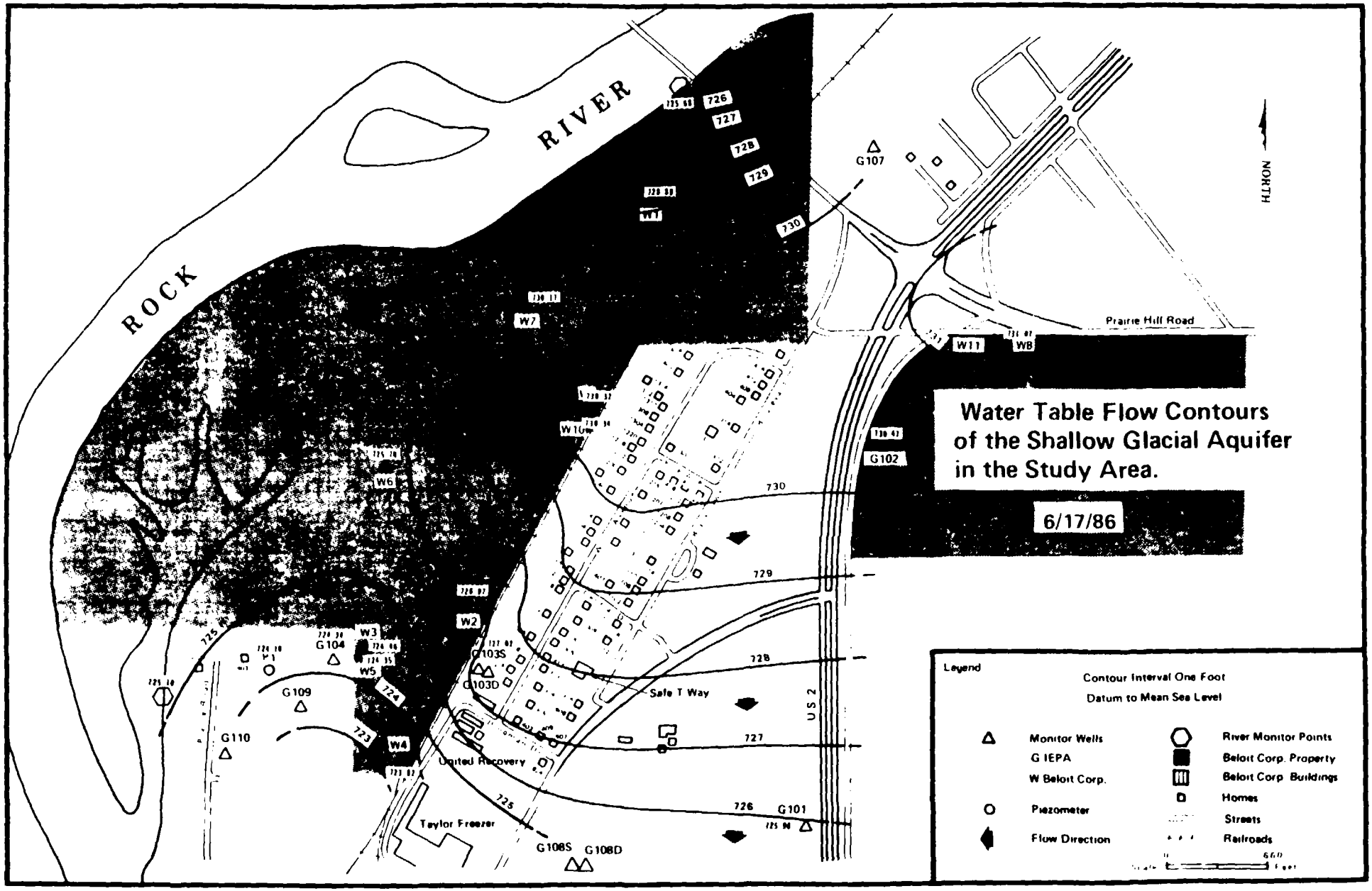
Flow Direction
River Monitor Points
Beloit Corp Property
Beloit Corp Buildings
Homes
Streets
Railroads

Appendix A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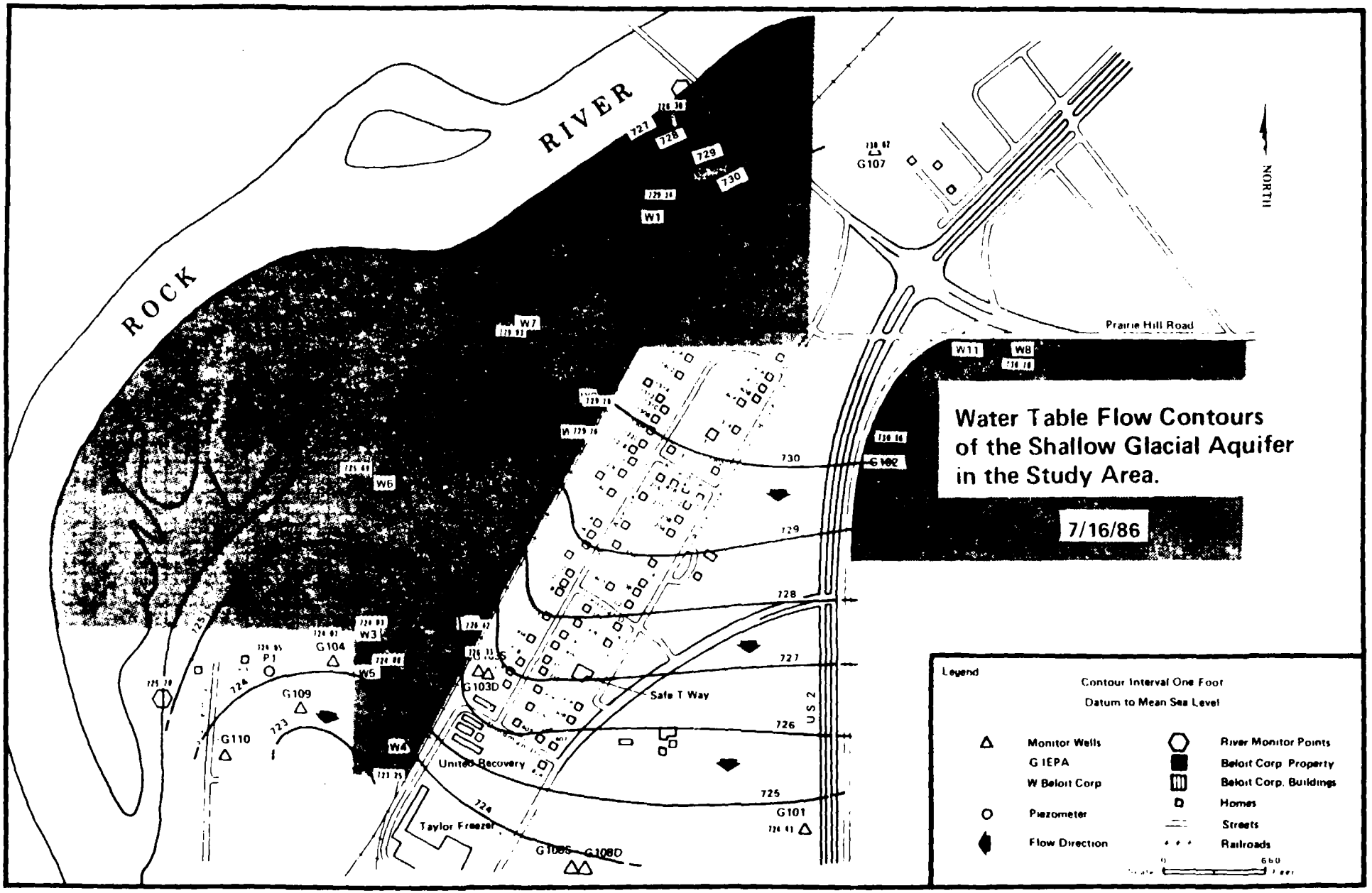
Appenuix A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Water Table Flow Contours
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Flow Direction
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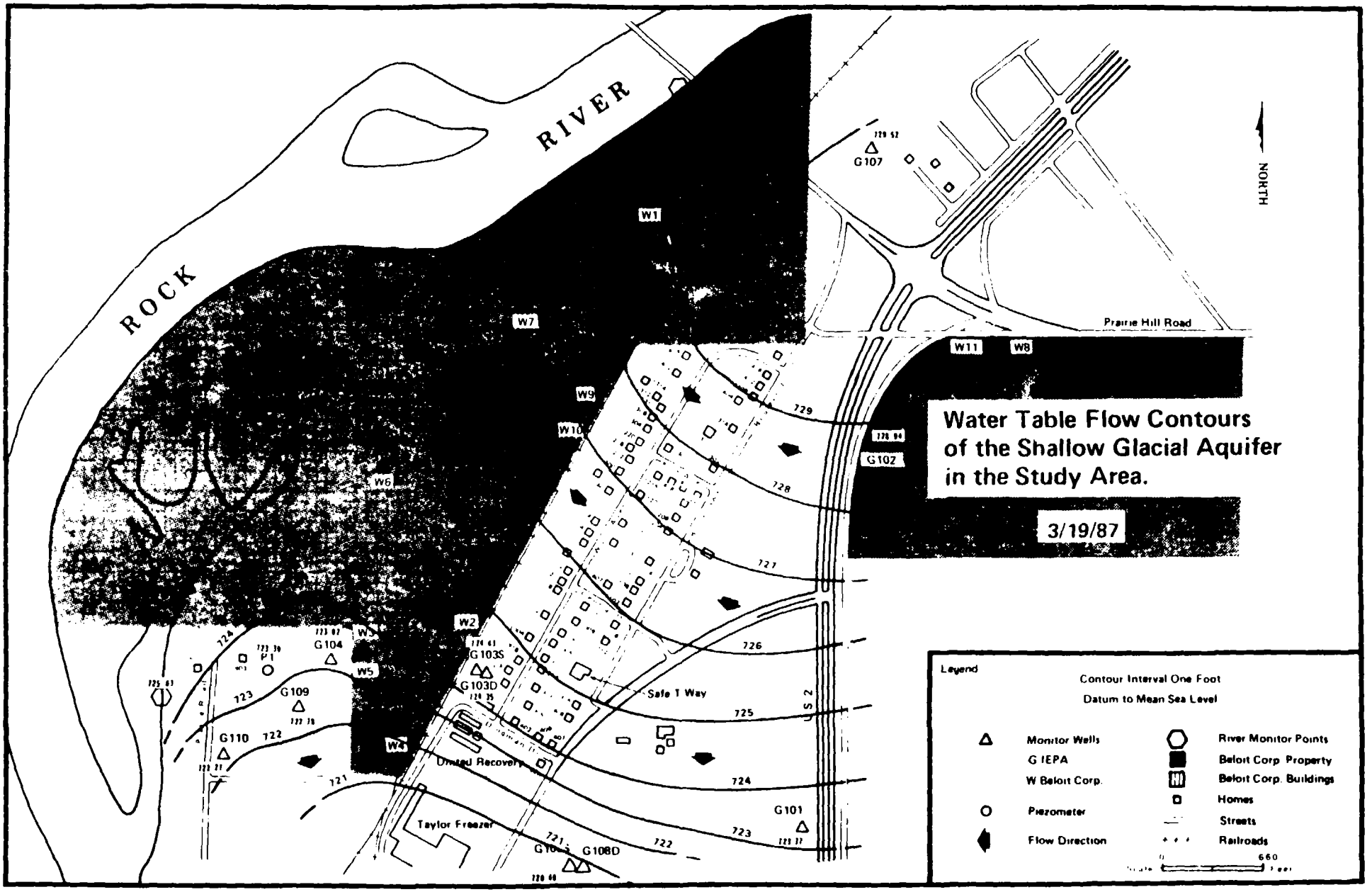
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Water Table Flow Contours
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in the Study Area.
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Datum to Mean Sea Level
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Flow Direction
River Monitor Points
Beloit Corp. Property
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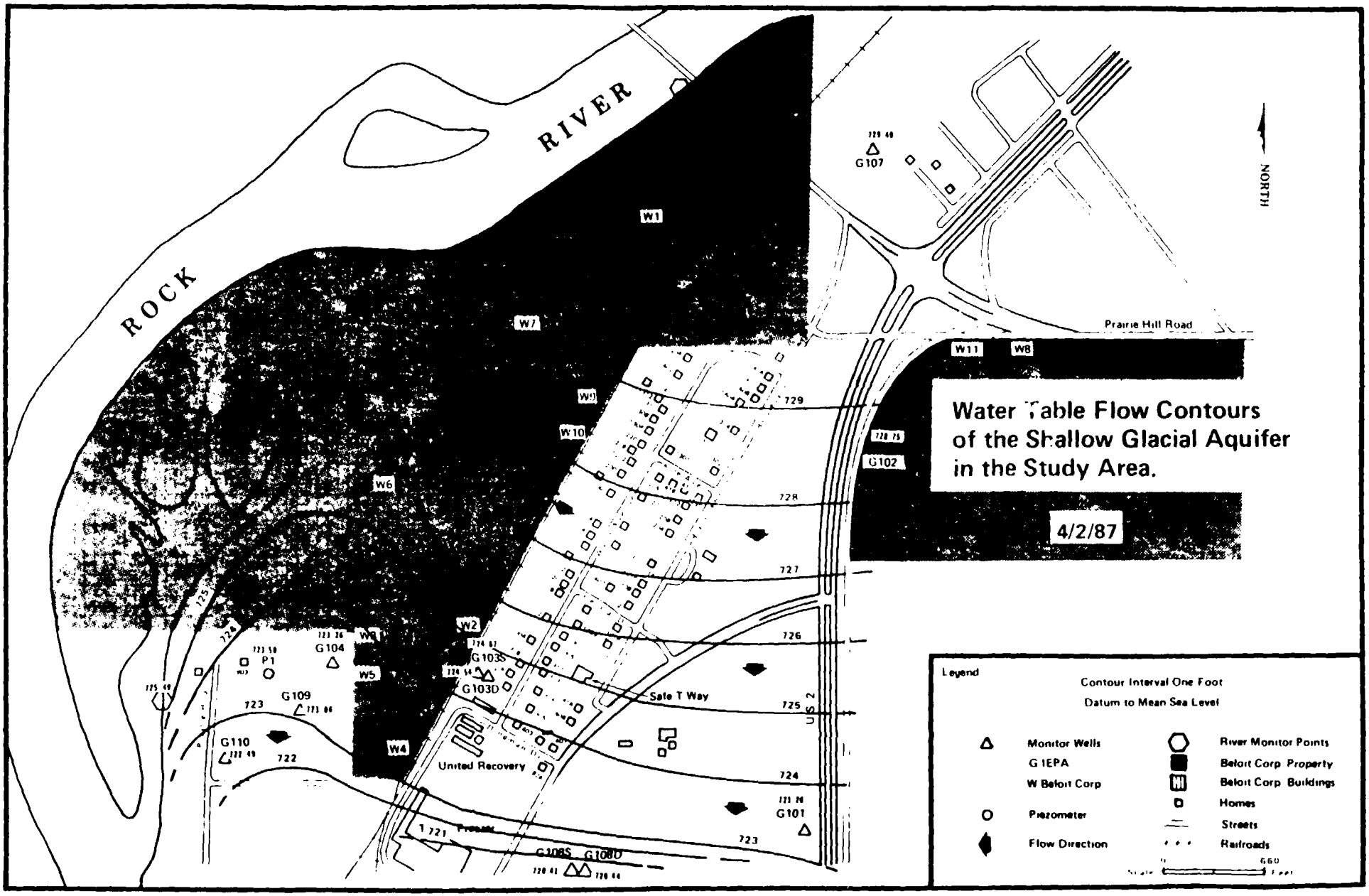
Appendix A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Water Table Flow Contours of the Shallow Glacial Aquifer in the Study Area.
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Monitor Wells
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Flow Direction
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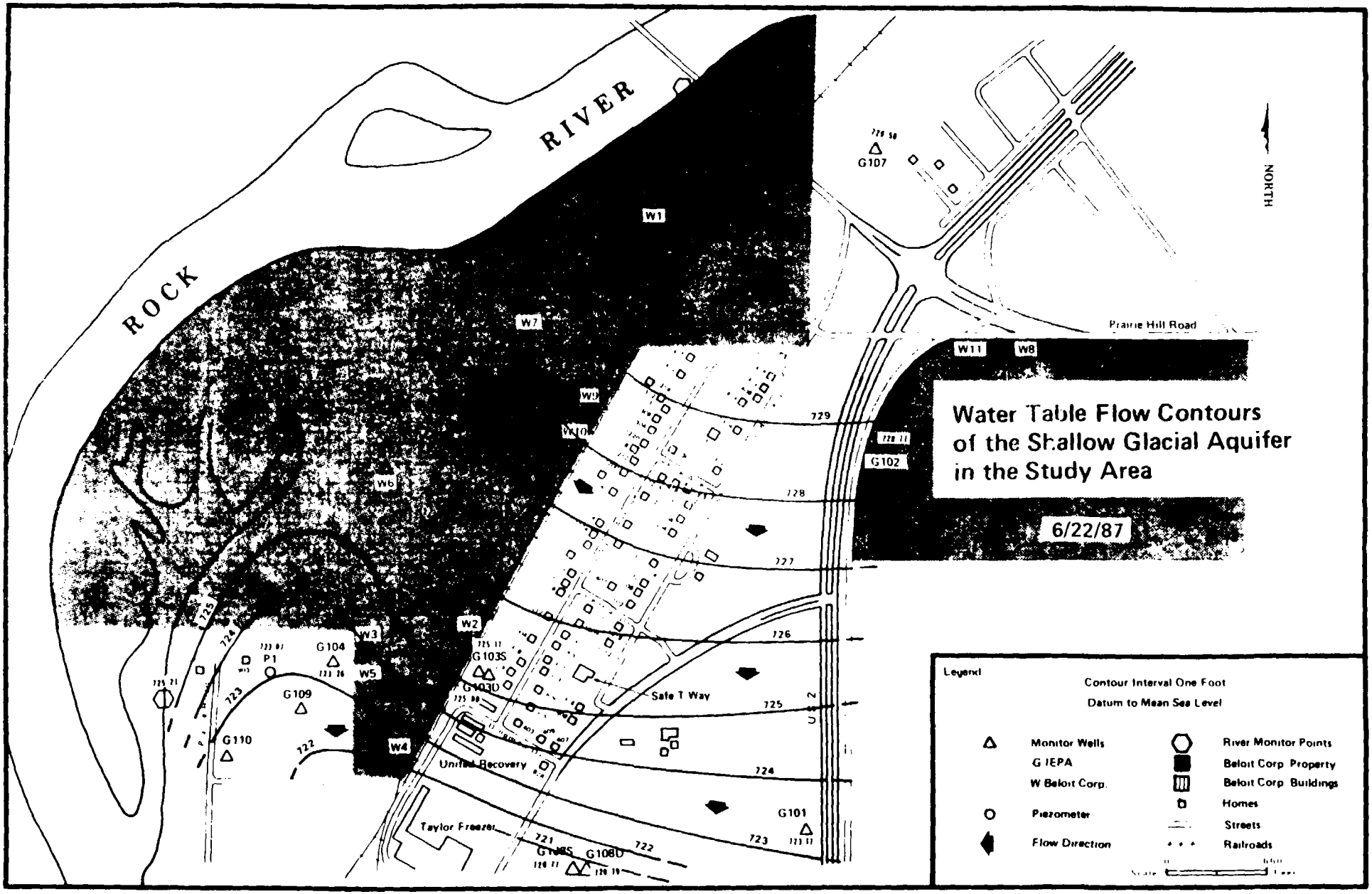
Appendix A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Water Table Flow Contours of the Shallow Glacial Aquifer in the Study Area
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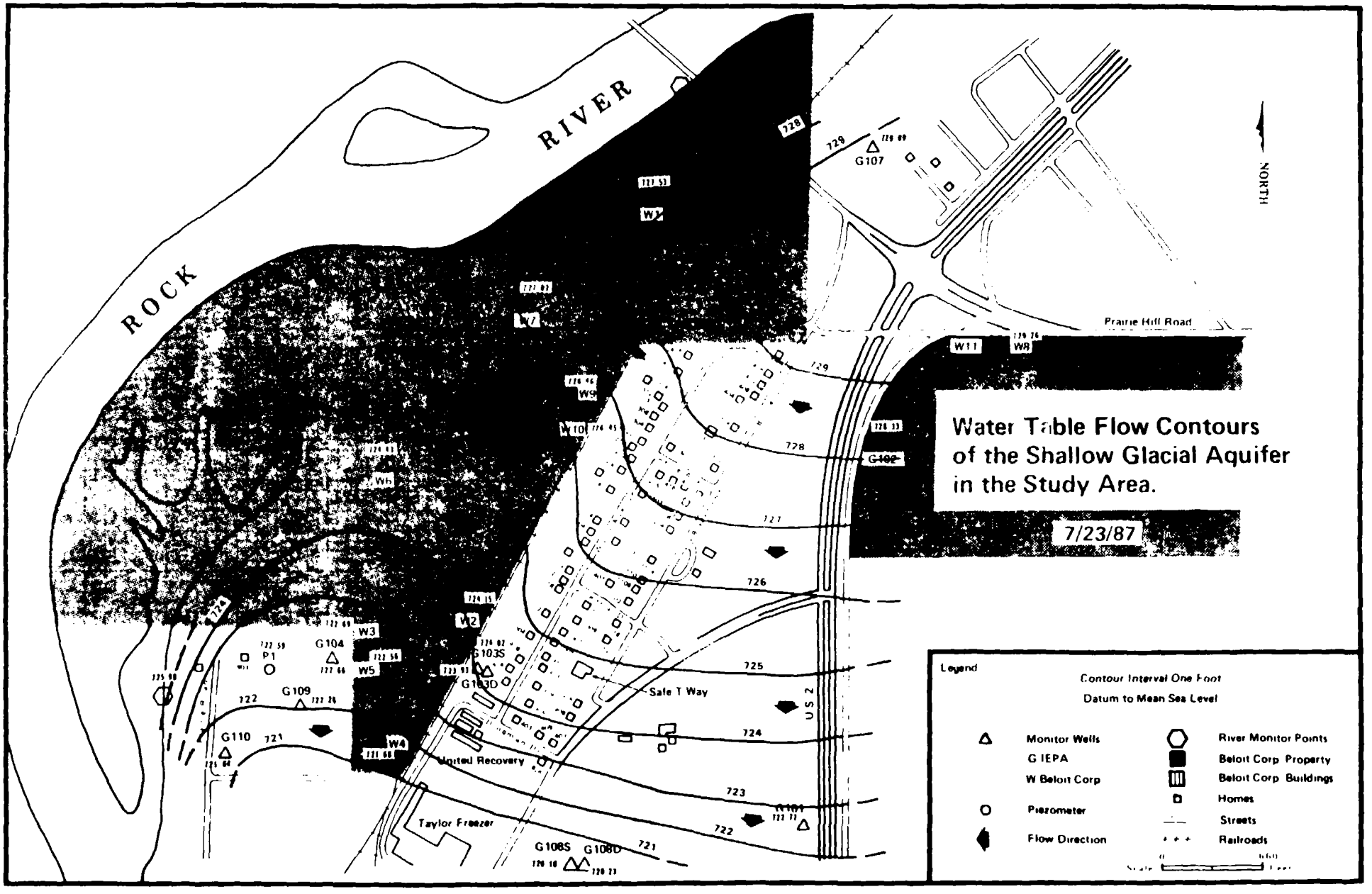
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Appendix A

APPENDIX B

CHEMICAL ANALYSES OF MONITOR WELLS

AND PRIVATE DRINKING WATER WELLS

Chemical Analyses of Samples from Monitoring Wells.

Samples taken July, 1986

	1,1,1 Trichloroethane	Tetrachloroethylene	1,1 Dichloroethane	1,1 Dichloroethylene	trans 1,2 Dichloroethylene	Trichloroethylene	Chloroform	Chlorodibromomethane	Bromoform	Benzene	Methylene Chloride	No VOC's detected
EPA G103S												0
EPA G103D												0
EPA G104	90	4	15			10						
EPA G107												0

Samples taken March, 1987

EPA G103D												0
EPA G104	37	4	8			11						
EPA G107												0
EPA G108S												0
EPA G109	43		25			1						
EPA G110												0

Samples taken June, 1987

EPA G108D												0

Values reported in parts per billion.

Chemical Analyses of Drinking Water.
Samples taken May and June, 1986

	1,1,1 Trichloroethane	Tetrachloroethylene	1,1 Dichloroethane	1,1 Dichloroethylene	Trans 1,2 Dichloroethylene	Trichloroethylene	Chloroform	Chlorodibromomethane	Bromoform	Benzene	Methylene Chloride	No VOC's detected
905 Watts	2	2					1					
909 Watts	1						1					
910 Watts	120	45	1	7		2						
913 Watts												0
914 Watts	60										2	
917 Watts												0
918 Watts	9	30									1	
1004 Watts	4											
1012 Watts												0
1018 Watts												0
1304 Watts												0
1308 Watts												0
908 Blackhawk												0
403 Dingman												0
409 Dingman												0
900 N. Prairie												0
903 N. Prairie												0

Values reported in parts per billion.

Chemical Analyses of Drinking Water.

Samples taken September, 1986

	1,1,1-Trichloroethane	Tetrachloroethylene	1,1-Dichloroethane	1,1-Dichloroethylene	Trans 1,2-Dichloroethylene	Trichloroethylene	Chloroform	Chlorodibromomethane	Bromoform	Benzene	Methylene Chloride	No VOC's detected
905 Watts	4	1									1	
909 Watts											1	
910 Watts	27	48		7		2					1	
914 Watts	31	1		4							1	
918 Watts	6	70									3	
1004 Watts	3	1									2	
1005 Watts											2	
1007 Watts		1										
1012 Watts											1	
1020 Watts											2	
1104 Watts											1	
1114 Watts											1	
1140 Watts	1					1					1	
1200 Watts	1										2	
1212 Watts	3	1									3	
1304 Watts	6										3	
1308 Watts	2										3	
1314 Watts	6				11	9					1	
1402 Watts										3	1	
916 *Blackhawk*												0
403 Dingman											1	
409 Dingman	2					3					1	

Values reported in parts per billion.

Chemical Analyses of Drinking Water.

Samples taken January and February, 1987

	1,1,1 Trichloroethane	Tetrachloroethylene	1,1 Dichloroethane	1,1 Dichloroethylene	Trans 1,2 Dichloroethylene	Trichloroethylene	Chloroform	Chlorodibromomethane	Bromoform	Benzene	Methylene Chloride	No VOC's detected
905 Watts												0
909 Watts												0
910 Watts	212	300	2	17		2		1	1		1	
914 Watts	31	2		2							1	
917 Watts												0
918 Watts	1	29										
1004 Watts	1											
1005 Watts												0
1007 Watts												0
1009 Watts											1	
1011 WAtts											1	
1012 Watts												0
1020 Watts											1	
1102 Watts											1	
1113 Watts											1	
1117 Watts											1	
1140 Watts												0
1200 Watts											1	
1215 Watts												0
1220 Watts												0
1301 Watts												0
1304 Watts	1											
1314 Watts	4		2		12	10						
1402 Watts												0
1404 Watts												0

Values reported in parts per billion.

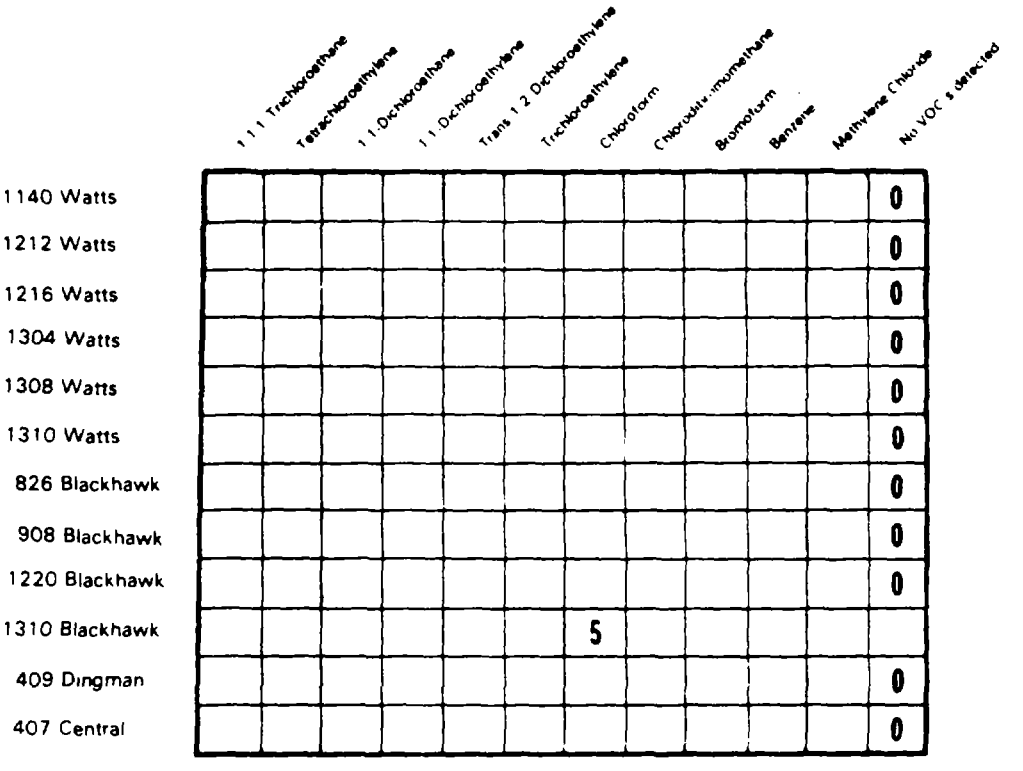
Chemical Analyses of Drinking Water.

Samples taken January and February, 1987

	1,1,1-Trichloroethane	Tetrachloroethylene	1,1-Dichloroethane	1,1-Dichloroethylene	Trans 1,2 Dichloroethylene	Trichloroethylene	Chloroform	Chlorodibromomethane	Bromoform	Benzene	Methylene Chloride	No VOC's detected
1012 Blackhawk												0
1016 Blackhawk												0
1106 Blackhawk												0
1110 Blackhawk												0
1114 Blackhawk												0
1204 Blackhawk												0
1208 Blackhawk												0
1212 Blackhawk												0
1220 Blackhawk							1					
1302 Blackhawk												0
1310 Blackhawk							12					
1314 Blackhawk												0
1404 Blackhawk												0
1408 Blackhawk												0
1416 Blackhawk												0
409 Dingman												0
407 Dingman												0
407 Central												0
410 Kile												0
900 N Prairie												0
903 N Prairie												0
Beloit Corp												0

Values reported in parts per billion.

Chemical Analyses of Drinking Water.
Samples taken May and June, 1987



Values reported in parts per billion.

APPENDIX C

CHEMICAL PROPERTIES AND MAXIMUM CONTAMINANT LEVELS FOR CONTAMINANTS IN GROUND WATER

Contaminant	*Chemical Formula*	*Density 20/4°C*	*Solubility 20°C*	*Maximum Contaminant Found in Study Area*	*Maximum Contaminant Levels (MCL)*
1,1,1-Trichloroethane	CH_3CCL_3	1.35	4,400 mg/l	212 ppb	200 ppb
Tetrachloroethylene	$CCL_2=CCL_2$	1.626	2900 mg/l	300 ppb	5 ppb*
1,1-Dichloroethane	$CHCL_2CH_3$	1.174	5,500 mg/l	5ppb	NA
1,1-Dichloroethylene	CH_2CCL_2	1.218	2,640 g/cu m	17 ppb	7 ppb
Trans 1,2-Dichloroethylene	CHCLCHCL	1.26	600 mg/l	11 ppb	2 ppb*
Trichloroethylene	$CCL_2=CHCL$	1.46	1,100 mg/l 25°C	11 ppb	5 ppb
Chloroform	$CHCL_3$	1.489	8,000 mg/l	12 ppb	These three contaminants have a combined total MCL of 100 ppb.
Chlorodibromomethane	$CHBR_2CL$	2.440		1 ppb	
Bromoform	$CHBR_3$	2.89	3,190 mg/l	1 ppb	
Benzene	C_6H_6	0.8786	1,780 mg/l	3 ppb	5 ppb
Methylene Chloride	CH_2CL_2	1.326	20,000 mg/l	3 ppb	5 ppm *

* Expected levels

Chemical Properties and Maximum Contaminant Levels for Contaminants in Ground Water.

Sources. Verschueren 1983 Handbook of Enviromental data on Organic Chemicals, second edition

Sax. 1984. Dangerous Properties of Industrial Materials, sixth edition

APPENDIX D

BORING LOGS AND WELL CONSTRUCTIONS

Illinois Environmental Protection Agency

BORING NO	WELL NO	GROUNDLEVEL ELEV	PAGE	OF
B-1	G 101	703.7	1	1

COUNTY	SITE NO
Winnebago	201013502

SITE: Rockton/Peterman

BORING LOCATION: ¼ mi S of intersection 75 + Route 2, W side of Roadway

DRILLING EQUIPMENT	SIZE	TYPE
CME-55	3¼ in ID	Hollow Stem Auger

COMPLETION DEPTH	BEDROCK DEPTH	TOP OF CASING Elevation
53.0'	—	766.371

DATE START	DATE FINISH
5/15/84	5/15/84

TIME START	TIME FINISH
7:30 AM	11:30 AM

ANNULUS FILL MATERIAL
ABOVE PACKING: Cuttings
PACKING: Concrete w/ 5% granular bentonite
SCREEN: Slough

WELL CASING TYPE AND QUANTITY: 2" PVC Pipe w/ screw joints (teflon taped joints)
(hack saw) screen

SCREEN INTERVAL TYPE AND QUANTITY: 15.0' of screened PVC : screened interval 37.3'-52.3'

PERSONNEL
L. JME
D. DMT
H. KWB

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft.	Penetrometer (Strength)	N Value (Blows)	REMARKS
	0.0-2.4 Silt - brown to black, scattered sand, med grained, very weathered, friable, sl. damp roots.	0						
	@ 1.9-2.4 damp	1			36/50			
	2.4-2.5 Sand - lt brown to pink, sl. damp fine to med grained, friable, small amount of Fe staining	2						
	@ 2.4-2.45 Quartzite - rose in color, v. angular, small to med	3						
	2.5-3.4 Sandy Gravel - lt. brown, sl. damp, friable, Gravel - rounded and angular Sand - sub-rounded, sub-ang.	4						
	@ 2.9 sl moist, Fe stain	5		CS				Augered from 5.0 - 53.0
	9.0-9.5 Gravelly Sand - brown, somewhat bedded. Gravel - rounded, various sizes Sand - moist, fine, med & large grains Sub angular - sub-rounded	10						
	9.5-15.2 Sand & Gravel - brown	15						
	@ 15.2 - 25.0 moist							
	@ 25.0 - 45.0 very moist							
	42.0 ▼							
	End of Boring @ 53.0	53						
	55.1' of PVC							
	15' of screen							
	2.8' of stick up							

Illinois Environmental Protection Agency

BORING NO: B-2 | WELL NO: B-102 | GROUNDLEVEL ELEV: 766.9 | PAGE: 1 OF 1

COUNTY: Winnebago | SITE NO: 2010302

SITE: Rockton / Soterian

BORING LOCATION: 200 yds N of intersection 75 + Route 2 E side of Roadway

DRILLING EQUIPMENT: CME-55 | SIZE: 3¼ in ID | TYPE: Hollow Stem Auger

COMPLETION DEPTH: 49.0 | BEDROCK DEPTH: — | TOP OF CASING Elev.: 769.621

DATE: START 5/15/84 FINISH 5/15/84

TIME: START 2:00 PM FINISH 4:00 PM

ANNULUS FILL MATERIAL: ABOVE PACKING Cuttings; PACKING Concrete w/ 5% granular bentonite; SCREEN Slough

WELL CASING TYPE AND QUANTITY: 2" PVC Pipe w/ screw joints (teflon taped joints)

SCREEN INTERVAL TYPE AND QUANTITY: 15.0' of screened PVC ; screened interval 34.1' - 49.1

PERSONNEL: L. JME; D. DMT; H. KWB

ELEV	DESCRIPTION	DEPTH	Sample No	Sampler Type	Sample Recovery Ft	Penetrometer (Strength)	N Value (Blows)	REMARKS
766.9	0.0 - 2.2 Silt - brown to black, damp, friable, sand grains found scattered through sample, roots	0			36/5.0			Augered from 5.0 - 49.0
	2.2 - 3.6 Sand - reddish brown, med. grained, damp, v uniform	1						
	5.0 - 6.0 Clayey Sand - brown, v. moist.	2						
	6.0 - 12.5 Sand - brown, v. uniform med grained, v moist	3						
	12.5 - 49.0 Sand & Gravel - brown sub-angular - sub-rounded moist. 39.5' ▼	4						
		5	CS					
717.9	End of Boring 49.0'	49						
	51.8' of PVC							
	15.0' of screen							
	2.7' stick up							

IL 532-1112

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-1 Monitor Well No. P-1

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. 732.5' Completion Depth 35'

Fed ID. No. _____ Auger Depth 35' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46 N., R 1 E. Date: Start 5-7-86 Finish 5-8-86

Boring Location Trull Property

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - J. Morse; H -

Elev. 732.5	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-1ft. Dark brown silty soil 1-2.5ft. Dark brown silt with some sand 2.5-20.0ft. Light brown sandy gravel, ranging from coarse sand to 4" in size, poorly sorted. At 20ft. sandy gravel becomes less coarse ranging in size from sand to 2", poorly sorted.	5 10 15 20 25 30							Description from cuttings
697.5	Boring Completed at 35' Water levels Upon completion 8.3' from ground surface After 24 hrs. 7.45' from ground surface	35							Had to flush sand and gravel to install piezometer

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-2 Monitor Well No. G103S

Site File Name Rockton/Watts Ave Groundwater Contam. Surface Elev. 746.4 Completion Depth 25.75'

Fed. ID. No. _____ Auger Depth 25.75' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46N. R 1E. Date: Start 5-14-86 Finish 5-15-86

Boring Location 910 Watts near R.R. tracks

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - J. Morse; H -

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
746.4	0-2.3ft. Black silt (topsoil) 2.3-5.0 Brown med. to fine sand 5.0-10.0 Brown sand and gravel ranging in size from sand to 4", poorly sorted. 10.0-12.0 Brown gravelly sand coarseness decreases with depth 15.0-25 Light brown silty Sand with some gravel up to 1" in size, trace clay.	5 10 15 20 25							Description from cuttings Water at 21.0 ft.
720.6	Boring completed at 25.8 ft.	30							

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No. 2010350003 County Winnebago Boring No. B-3 Monitor Well No G104

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. 741.7 Completion Depth 25'

Fed ID No. _____ Auger Depth 25' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46N., R 1E. Date: Start 5-21-86 Finish 5-21-86

Boring Location East side of Trull Property

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

SAMPLES: Sample No | Sample Type | Sample Recovery | Penetrometer | N Values (Blows) | OVA or HNU readings

Personnel: G - S. Otto; D - D. Tolan; H - J. Morse; H -

Elev.	DESCRIPTION	Depth in feet	REMARKS
741.7	0-1ft. Black silt (top soil)		Description from cuttings
	1-4ft. Gravel with some sand up to 3" in size, well rounded, poorly sorted.	5	
	4-10ft. increasing amounts of sand, fewer pebbles	10	
	10-20ft. Gravelly Sand (≈30% gravel) grain size decreasing with depth.	15	
	20-25ft. Sand med. to coarse grain with some silt, wet.	20	Water at 20 ft.
716.7	Boring Completed at 25ft.	25	
	Water level after 3hrs. 16.72 ft. from ground surface		

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-6 Monitor Well No. G103D

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. 746.1 Completion Depth 49'

Fed. ID. No. _____ Auger Depth 49' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46N., R 1E. Date: Start 6-26-86 Finish 6-26-86

Boring Location 910 Watts near R.R. tracks

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

SAMPLES: Sample No | Sample Type | Sample Recovery | Penetrometer | N Values (Blows) | OVA or HNU readings

Personnel: G - S. Otto; D - D. Tolan; H - J. Morse; H -

Elev.	DESCRIPTION	Depth in feet	REMARKS
746.1	0-3ft. Black sandy silt (v.f. sand) top soil		Description from cuttings
	3-5ft. Dark brown silty Sand v.f. grain	5	
	5-10ft. Gravel ranging from ½" to 3" in size, well rounded.	10	
	10-18ft. Light brown gravelly Sand, coarse to v. coarse, gravel up to ½" in size, well rounded, poorly sorted.	15	
	18-20ft Light brown Sand with some gravel up to ¼" in size, med. grain sand.	20	
	20-22ft. Light brown sandy Gravel up to 2" in size, well rounded.	25	
	22-35ft Light brown Sand med. to coarse grain, some gravel, some clay.	30	
	35-43ft. Light pinkish brown sandy Clay with some gravel.	35	
	43-49ft. Light yellow brown sandy Clay very wet.	40	
697.1		45	
	Boring Complete at 49ft.	50	
	Water level after 24hrs., 22.56 ft from ground surface		

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-7 Monitor Well No. G107

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. _____ Completion Depth 49'

Fed. ID. No. _____ Auger Depth 49' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46N., R 1E Date: Start 7-16-86 Finish 7-16-86

Boring Location 2226 Blackhawk Blvd.

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto / J. Morse; D - K. Bosie; H - T. Murphy; H -

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-3 ft. Dark brown changing to a reddish brown at 1ft. Sand med. grain								Description from cuttings
	3-8 ft. Sandy Gravel, gravel up to 4" in size, rounded to well rounded, poorly sorted.	5							
	8-12 ft. Light brown gravelly Sand, gravel up to 1" in size, well rounded.	10							
	12-13 ft. Sandy Gravel, gravel up to 3" in size, well rounded, poorly sorted.	15							
	13-23 ft. Light brown gravelly Sand, med. to v. coarse grain, ≈ 30% gravel up to 1" in size.	20							
	23-31 ft. Light brown Sand with some gravel, coarse to v. coarse grain, poorly sorted, gravel is well rounded and up to ½" in size.	25							
		30							Driller Notes: Harder to drill at 30-31 ft.
	31-49 ft. Light brown sandy Gravel up to 2" in size, poorly sorted, well rounded.	35							
		40							
		45							Water at 45 ft.
	Boring Completed at 49 ft.	50							
	Water level after 24 hrs. 38.7 ft. from ground surface.								

Illinois Environmental Protection Agency — **Field Boring Log** — Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-8 Monitor Well No. G108

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. 754.0 Completion Depth 40ft

Fed. ID. No. _____ Auger Depth 40' Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46 N., R. 1 E. Date: Start 3-4-87 Finish 3-4-87

Boring Location Village Green Subdivision, aprox. 700' north of Adams St. + 300' east of Blackhawk

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - T. Murphy; H - K. Rogers

Elev	DESCRIPTION	Depth in feet	SAMPLES: Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-1.5 Black clayey sandy Silt 1.5-13ft. Lt. brown sandy Gravel ranging from ⅛" to 4" in size, rounded to well rounded, poorly sorted. 13.-30 ft Lt. brown gravelly Sand, coarse to very coarse grain, gravel ranges in size from ¼" to 1", rounded to well rounded. At 20 ft. becomes more sand and less gravel. 30-40 ft. Lt. brown Sand med. to coarse grain, well sorted.	5, 10, 15, 20, 25, 30, 35, 40							Description from cuttings Drill rig chatter at 1.5 ft. At 30 ft. Stopped drilling for 15 min. - No water. Water at 35 ft.
	Boring Completed at 40 ft. Water levels: upon completion 33.3 ft. from ground surface After 17 hrs. 33.3 ft. from ground surface								

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-9 Monitor Well No. G-109

Site File Name Rockton/Watts Ave. Groundwater Contam Surface Elev. _____ Completion Depth 18 ft.

Fed. ID. No _____ Auger Depth 18.0 ft. Rotary Depth NA

Quadrangle South Beloit Sec. 12+13 T. 46N., R 1E. Date: Start 3-11-87 Finish 3-11-87

Boring Location Trull property SW of G104

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - T. Murphy; H -

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2 ft. Sandy clayey Silt 2-10 ft. Lt. brown sandy Gravel, well rounded, 1" to 4" in size, poorly sorted. 10-18 ft. Lt. brown gravelly Sand, coarse to very coarse grain, gravel is rounded to well rounded, poorly sorted	0 5 10 15							Description from cuttings Rig chatter at 2 ft.
	Boring Completed at 18 ft.	20							
	Water Levels Upon completion 12.9 ft. from ground level, On 3-12-87 at 10:22 A.M 12.9 ft. from ground level.								

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No.: 201035000 3 County Winnebago Boring No. B-10 Monitor Well No. G-110

Site File Name Rockton / Watts Ave. Groundwater Cont. Surface Elev. _____ Completion Depth 20ft

Fed. ID. No. _____ Auger Depth 20ft. Rotary Depth NA

Quadrangle South Beloit Sec. 13 T. 46N. R 1E. Date: Start 3-11-87 Finish 3-11-87

Boring Location Trull property SW of G-109

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - T. Murphy; H -

Elev.	DESCRIPTION	Depth in feet	Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-2 ft. Black clayey silt 2-7 ft. Lt. brown sandy Gravel, well rounded, poorly sorted, 1" to 4" in size. 7-20 ft. Lt. brown gravelly Sand, coarse to very coarse grain, gravel is ¼" to 1" in size, rounded to well rounded, poorly sorted.	0 5 10 15 20							Description from cuttings Rig chatter at 2 ft.
	Boring Completed at 20 ft.								
	Water Levels Upon completion 13.5 ft. from ground surface On 3-12-87 at 9:15 A.M. 13.6 ft. from ground surface								

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-11 Monitor Well No. _____

Site File Name Rockton/Watts Ave. Groundwater Contam. Surface Elev. _____ Completion Depth 85 ft.

Fed ID. No. _____ Auger Depth 85 ft. Rotary Depth _____

Quadrangle South Beloit Sec. 13 T. 46N. R 1E. Date: Start 3-31-87 Finish 3-31-87

Boring Location Village Green Subdivision ≈700' N. of Adams St. and 300' E. of Blackhawk Blvd.

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

Personnel: G - S. Otto; D - D. Tolan; H - T. Murphy; H -

Elev	DESCRIPTION	Depth in feet	SAMPLES: Sample No	Sample Type	Sample Recovery	Penetrometer	N Values (Blows)	OVA or HNU readings	REMARKS
	0-40 ft. same as B-8	0 ↓ 40							
	40-78 ft. Lt. brown Sand, med. grain, well rounded, well sorted.	40 45 50 55 60 65 70 75							At 60 ft. could hear water cascading into augers.
	78-85 ft. Pinkish gray silty Clay with some pebbles, very hard.	80 85							
	Boring Completed at 85 ft.								
	Water Levels Upon completion 34 ft. inside hollow stem augers.								
	Had to abort well installation due to 10 ft. of sand inside hollow stem augers. Upon removal of augers knock-out plate was intact. Theorized that sand had sifted into hollow stem augers between auger joints.								

Illinois Environmental Protection Agency **Field Boring Log** Page 1 of 1

Site File No.: 2010350003 County Winnebago Boring No. B-12 Monitor Well No. G-108D

Site File Name Rockton/Watts Ave. Groundwater Contam Surface Elev. 753.84 Completion Depth 72 ft.

Fed ID. No. _____ Auger Depth 72 ft Rotary Depth NA

Quadrangle South Beloit Sec. 13 T. 46N. R 1E. Date: Start 4-1-87 Finish 4-1-87

Boring Location Village Green Subdivision ± 700' N. of Adams St. and 300' E of Blackhawk Blvd.

Drilling Equipment CME 55 3¼" I.D. hollow stem auger

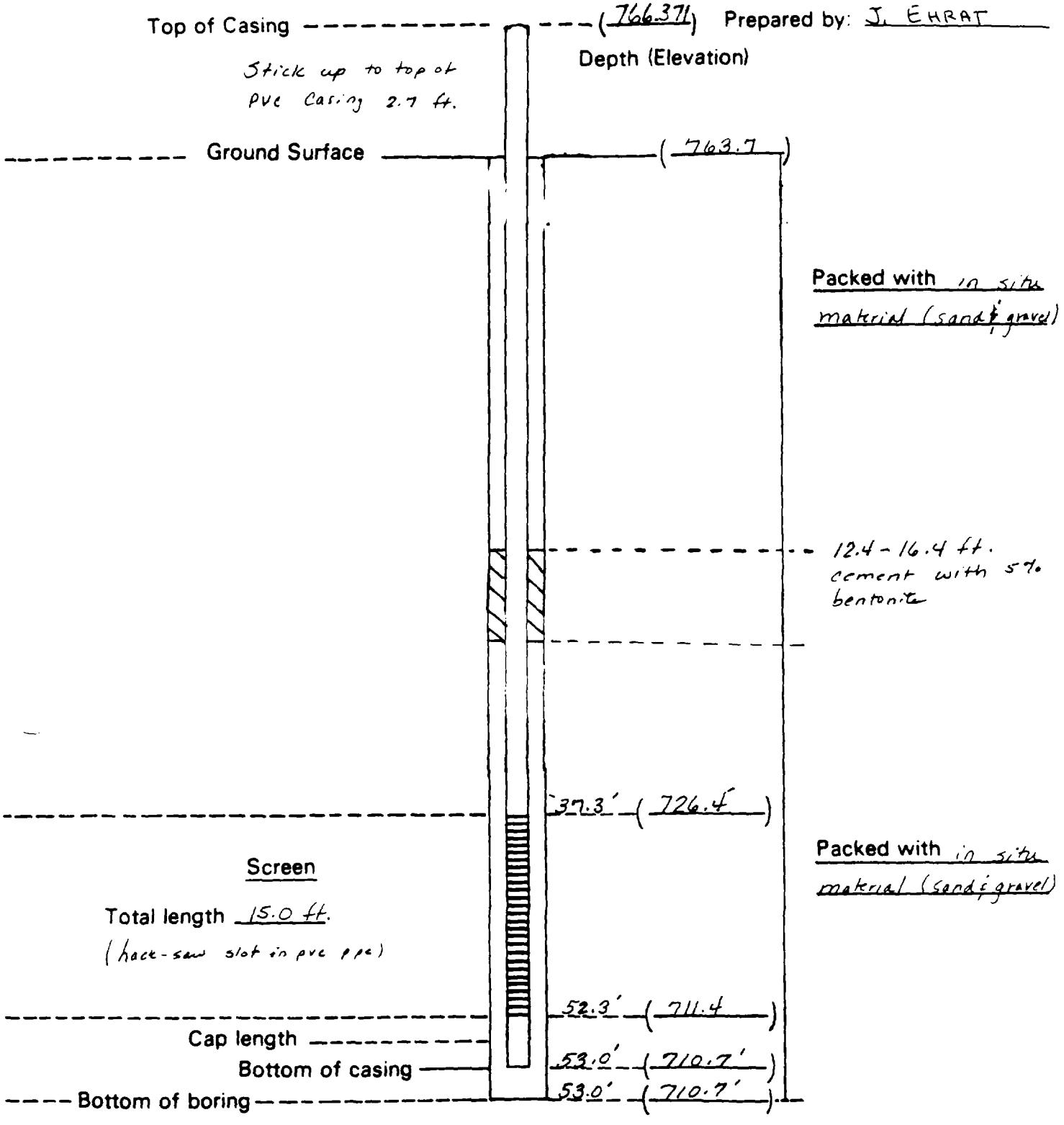
SAMPLES: Sample No | Sample Type | Sample Recovery | Penetrometer | N Values (Blows) | OVA or HNU readings

Personnel: G - S. Otto; D - D. Tolan; H - T. Murphy; H -

Elev.	DESCRIPTION	Depth in feet	REMARKS
	0-72 ft. Same as B-11	70	
	Boring Completed at 72 ft.	75	At 72 ft. driller notes more difficult to drill
	Water Level Upon completion 36.1 ft. from top of stainless casing		
	Note: Used O rings on auger joints, this kept the sand and water out of the hollow stem augers while drilling		
	Upon removal of augers, lead auger had a brown silt covering teeth.		

MONITOR WELL CONSTRUCTION

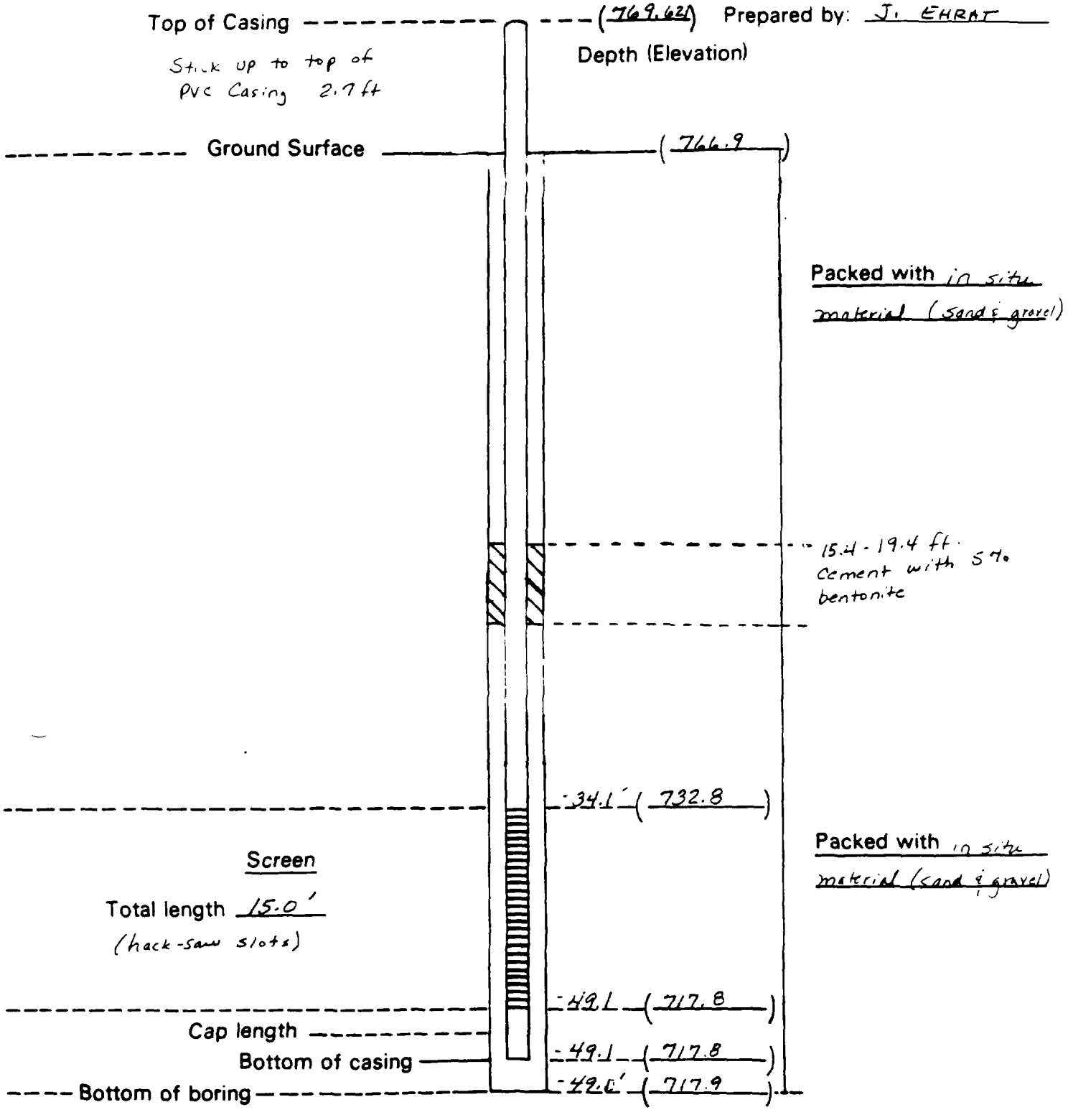
Location: Rockton Study
Site No.: _____
Well No.: G 101
Prepared by: J. Ehrat



Pipe: Type and quantity 2 in. I.D. sched 40 PVC w/ screw joints (teflon taped)
15.0 ft. hack saw screen. Total 55.1' of PVC

MONITOR WELL CONSTRUCTION

Location: Rockton Study
Site No.: _____
Well No.: G102
Prepared by: J. Ehrat



Pipe: Type and quantity 2 in. I.D. PVC pipe with screw joints (teflon tape)
15.0 ft. hack saw slots, total 51.8 ft. PVC casing.

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-1

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: P-1 (Piezometer)

Site File No.: LPC 2010350003 — Prepared By: S. Otto

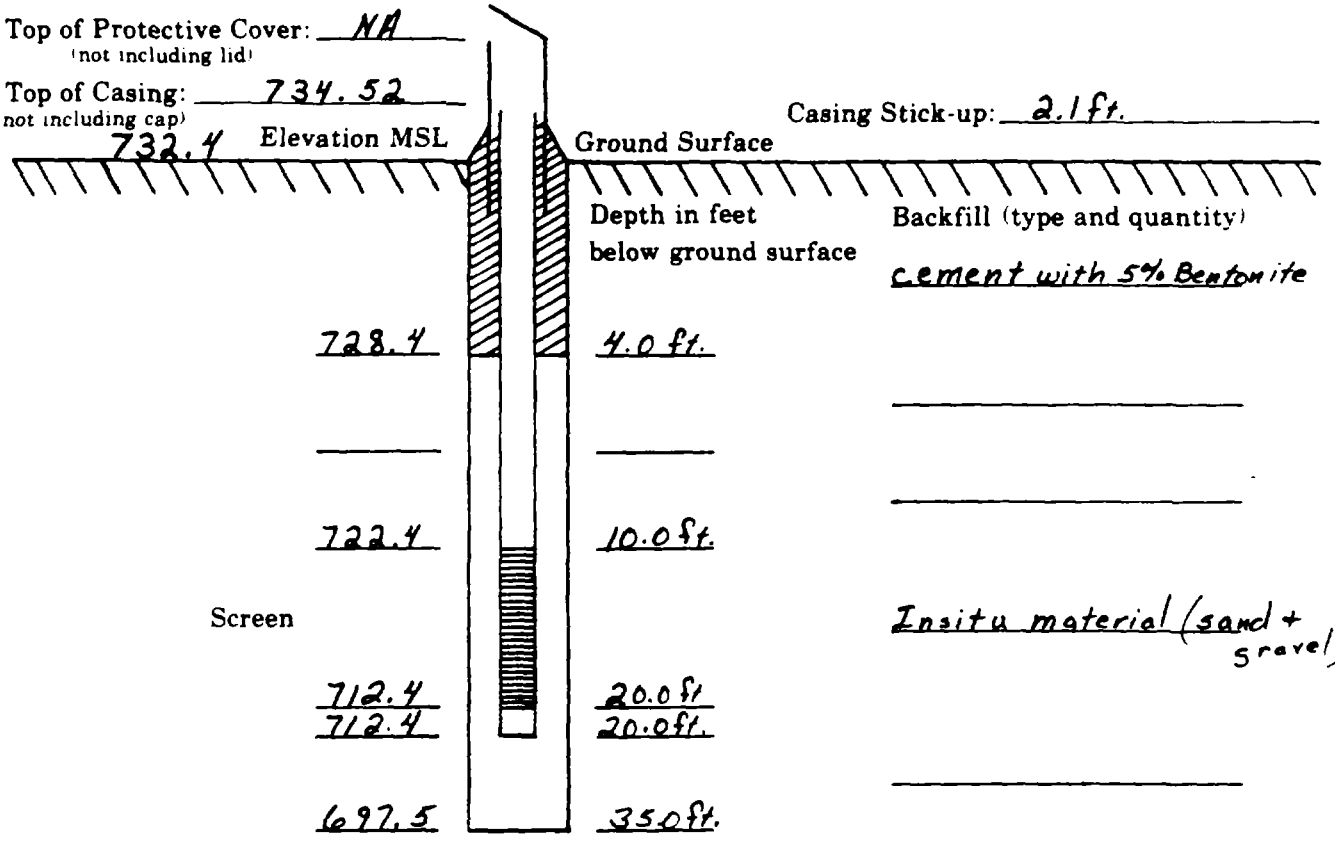
Monitor Well Location: Trull Property

Top of Protective Cover: NA (not including lid)

Top of Casing: 734.52 (not including cap)

732.4 Elevation MSL — Ground Surface

Casing Stick-up: 2.1 ft.



	Depth in feet below ground surface	Backfill (type and quantity)
728.4	4.0 ft.	cement with 5% Bentonite
722.4	10.0 ft.	
Screen		Insitu material (sand + gravel)
712.4	20.0 ft	
712.4	20.0 ft.	
697.5	35.0 ft.	

Casing Type and Size: PVC 2" I.D. sched. 40 glue joints

Screen Type and Size: PVC hack saw bottom 10 ft.

Casing Field Measurements:

bottom of screen _____

top of screen _____

1st joint _____

Total Length of Casing: 22.05 ft.

Plug (type): PVC

Cap (type): PVC

Protective Cover (type and size): NA

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-2

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G 103 S

Site File No.: LPC 2010350003 — Prepared By: S. Otto

Monitor Well Location 910 Watts near railroad tracks

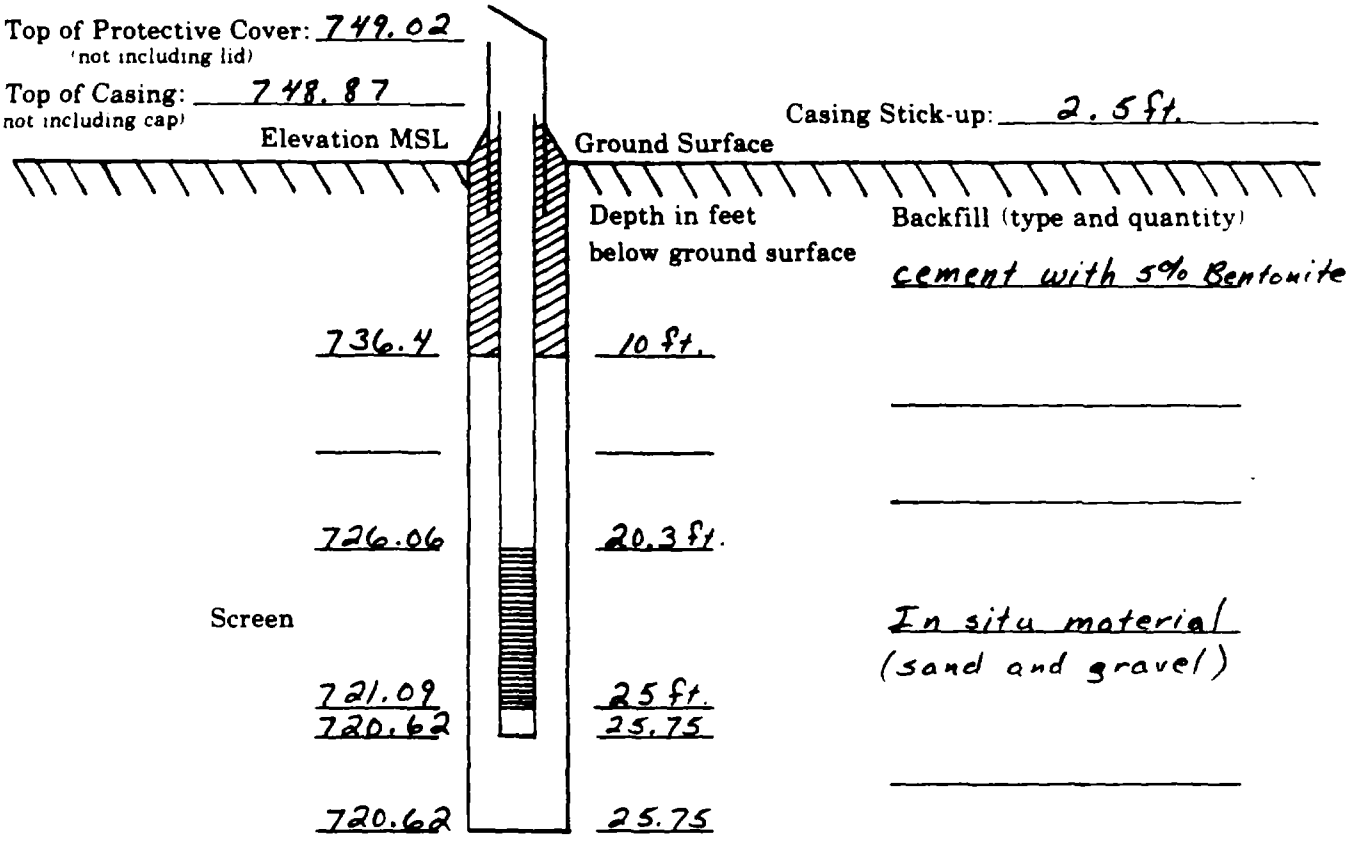
Top of Protective Cover: 749.02 (not including lid)

Top of Casing: 748.87 (not including cap)

Elevation MSL

Casing Stick-up: 2.5 ft.

Ground Surface



Depth in feet below ground surface	Backfill (type and quantity)
	cement with 5% Bentonite
736.4 / 10 ft.	
726.06 / 20.3 ft.	
Screen	In situ material (sand and gravel)
721.09 / 25 ft.	
720.62 / 25.75	
720.62 / 25.75	

Casing Type and Size: Type 316 stainless steel sched. 5 with sched. 40 threads

Screen Type and Size: Type 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen 0.47
top of screen 5.44
1st joint 15.61
10.02
5.17
total 30.80
- 2.55 cut off
28.25 ft.

Total Length of Casing 28.25 ft.

Plug (type) 316 stainless

Cap (type)

Protective Cover (type and size) 4" x 5' with locking cap and padlock (D)

teflon tape was used on all joints.

Illinois Environmental Protection Agency **Monitor Well Construction**

County: Winnebago Boring No.: B-3

Site File Name: Rockton/Watts Ave. Groundwater Contam. Monitor Well No.: G-104

Site File No.: LPC 2010350003 Prepared By: S. Otto

Monitor Well Location East side of Trull property

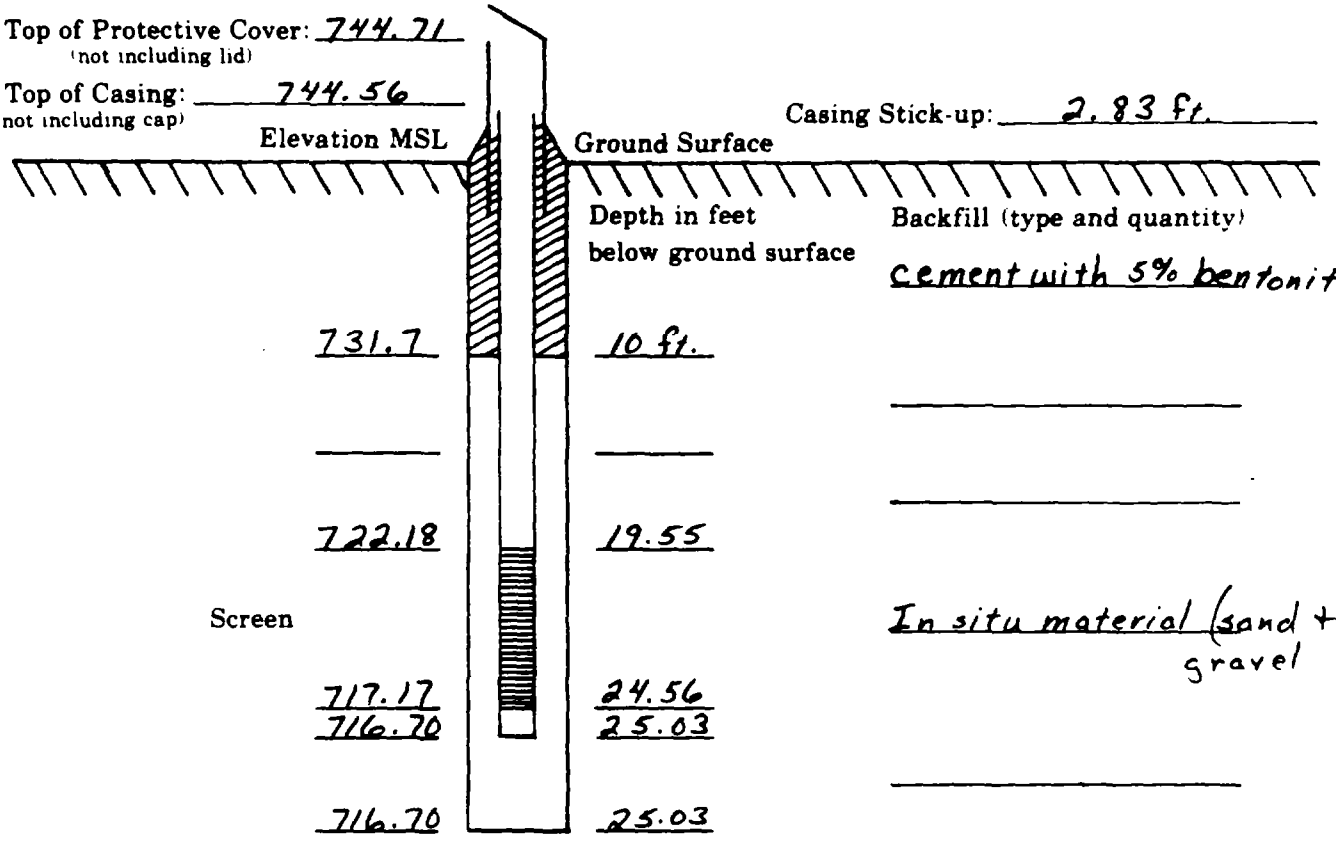
Top of Protective Cover: 744.71 (not including lid)

Top of Casing: 744.56 (not including cap)

Elevation MSL

Casing Stick-up: 2.83 ft.

Ground Surface



Elevation MSL	Depth in feet below ground surface	Backfill (type and quantity)
		cement with 5% bentonite
731.7	10 ft.	
722.18	19.55	
Screen		In situ material (sand + gravel
717.17	24.56	
716.70	25.03	
716.70	25.03	

Casing Type and Size: 316 stainless steel sched 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen 0.47
top of screen 5.48
1st joint 5.65
10.01
10.01
2.19
Total 27.86 ft.

Total Length of Casing 27.86 ft.

Plug (type) 316 stainless

Cap (type)

Protective Cover (type and size) 4" x 5' with locking cap and padlock (D)

teflon tape was used on all joints.

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-6

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G-103D

Site File No.: LPC 2010350003 — Prepared By: S. Otto

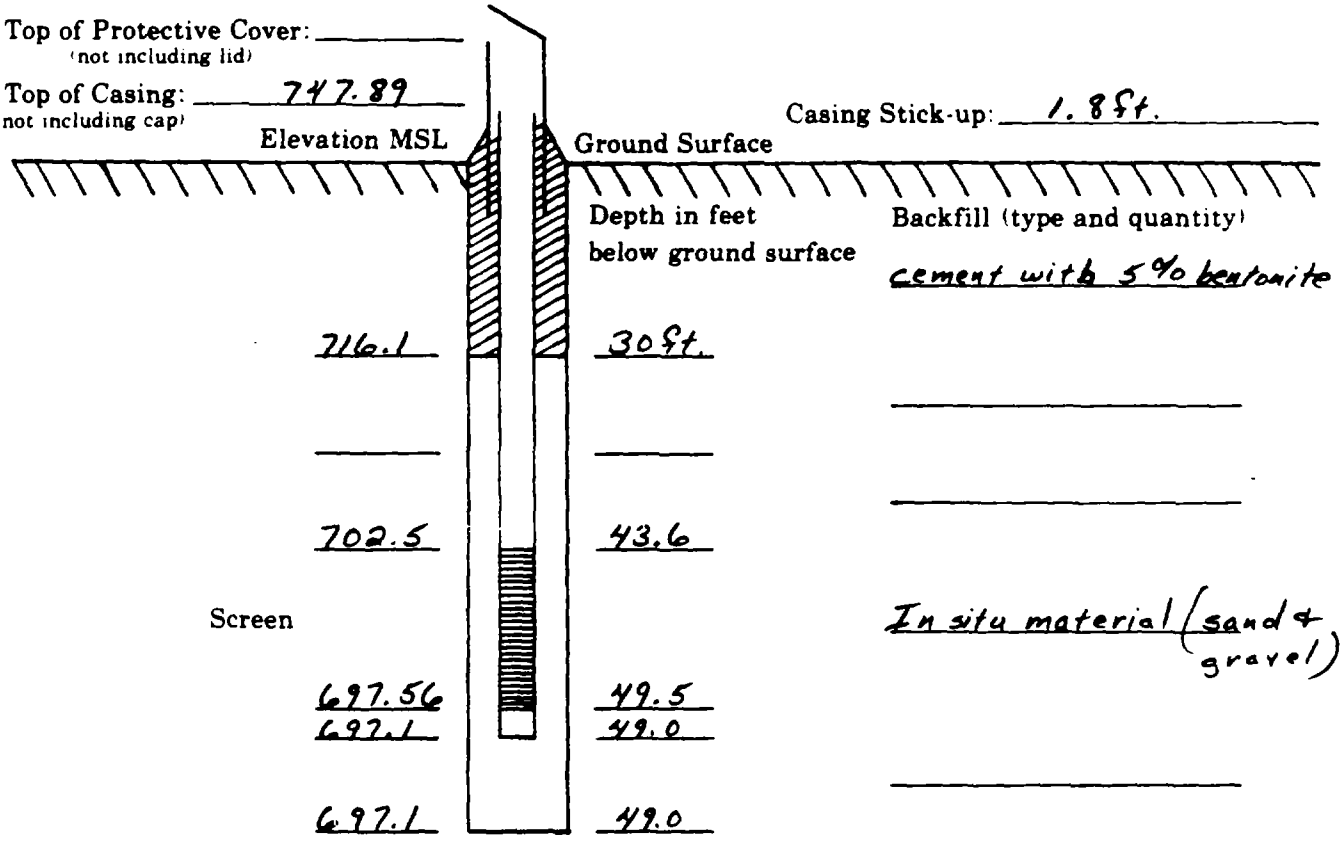
Monitor Well Location 910 Watts near railroad tracks

Top of Protective Cover: _____ (not including lid)

Top of Casing: 747.89 (not including cap) Elevation MSL

Casing Stick-up: 1.8 ft.

Ground Surface



	Depth in feet below ground surface	Backfill (type and quantity)
		cement with 5% bentonite
716.1	30 ft.	
702.5	43.6	
Screen		In situ material (sand & gravel)
697.56	49.5	
697.1	49.0	
697.1	49.0	

Casing Type and Size: 316 stainless steel sched. 5 with sched 40 threads 2" ID

Screen Type and Size: 316 stainless steel 0.01 slot 2" ID (D)

Casing Field Measurements:

bottom of screen	0.46
top of screen	5.44
1st joint	5.62
	15.62
	10.01
	10.00
	9.99
	5.00
	5.17
	50.79'

Total Length of Casing 50.79 ft.

Plug (type) 316 stainless

Cap (type) _____

Protective Cover (type and size) 4" x 5' with locking cap and padlock (D)

teflon tape was used on all joints

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-7

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G-107

Site File No.: LPC 2010350003 — Prepared By: S. Otto

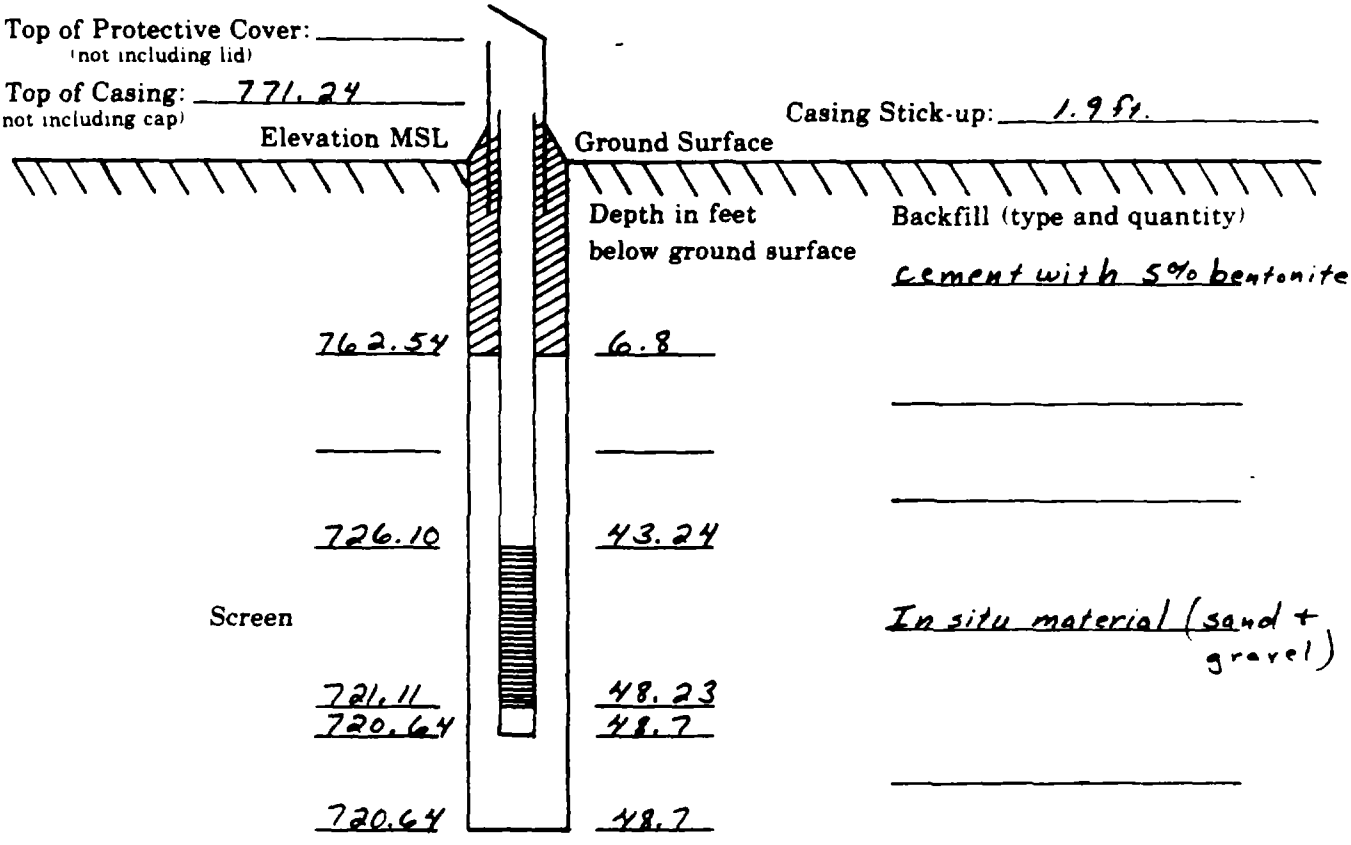
Monitor Well Location 2226 Blackhawk Blvd. in back yard

Top of Protective Cover: _____ (not including lid)

Top of Casing: 771.24 (not including cap) Elevation MSL

Casing Stick-up: 1.9 ft.

Ground Surface



	Depth in feet below ground surface	Backfill (type and quantity)
		cement with 5% bentonite
762.54	6.8	
726.10	43.24	
Screen		In situ material (sand + gravel)
721.11	48.23	
720.64	48.7	
720.64	48.7	

Casing Type and Size: 316 stainless steel sched. 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen	0.47
top of screen	5.46
1st joint	5.62
	10.02
	9.90
	10.02
	10.00
	10.02
	55.58

55.58 − 4.98 cut off = 50.60 ft.

Total Length of Casing 50.60 ft.

Plug (type) 316 stainless

Cap (type) _____

Protective Cover (type and size) 4"x5' with locking cap and padlock (D)

teflon tape was used on all joints.

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-8

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G-108s

Site File No.: LPC 2010350003 — Prepared By: S. Otto

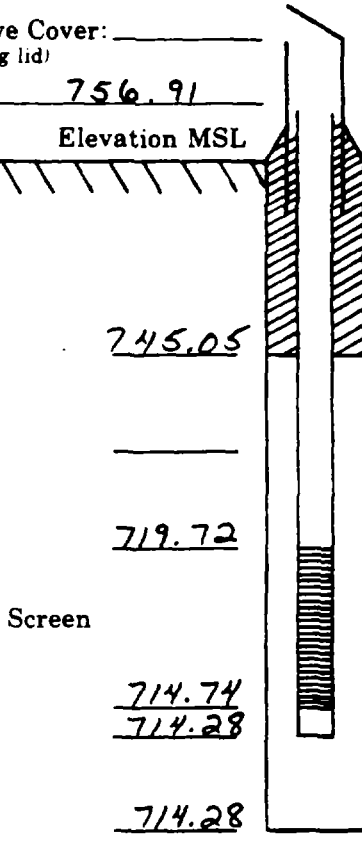
Monitor Well Location: Village Green Subdivision

Top of Protective Cover: _____ (not including lid)

Top of Casing: 756.91 (not including cap) Elevation MSL

Casing Stick-up: 2.86 ft.

Ground Surface



	Depth in feet below ground surface	Backfill (type and quantity)
745.05	9.0 ft	cement with 5% bentonite
719.72	34.33	
Screen		In situ material (sand + gravel
714.74	39.31	
714.28	39.77	
714.28	39.77	

Casing Type and Size: 316 stainless steel sched. 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen	0.46
top of screen	5.44
1st joint	5.60
	15.60
	10.0
	10.02
	5.0
	2.01
	42.63 ft.

Total Length of Casing: 42.63 ft.

Plug (type): 316 stainless

Cap (type): _____

Protective Cover (type and size): 4"x5' with locking cap and padlock (D)

teflon tape was used on all casing threads

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-9

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G-109

Site File No.: LPC 2010350003 — Prepared By: S. Otto

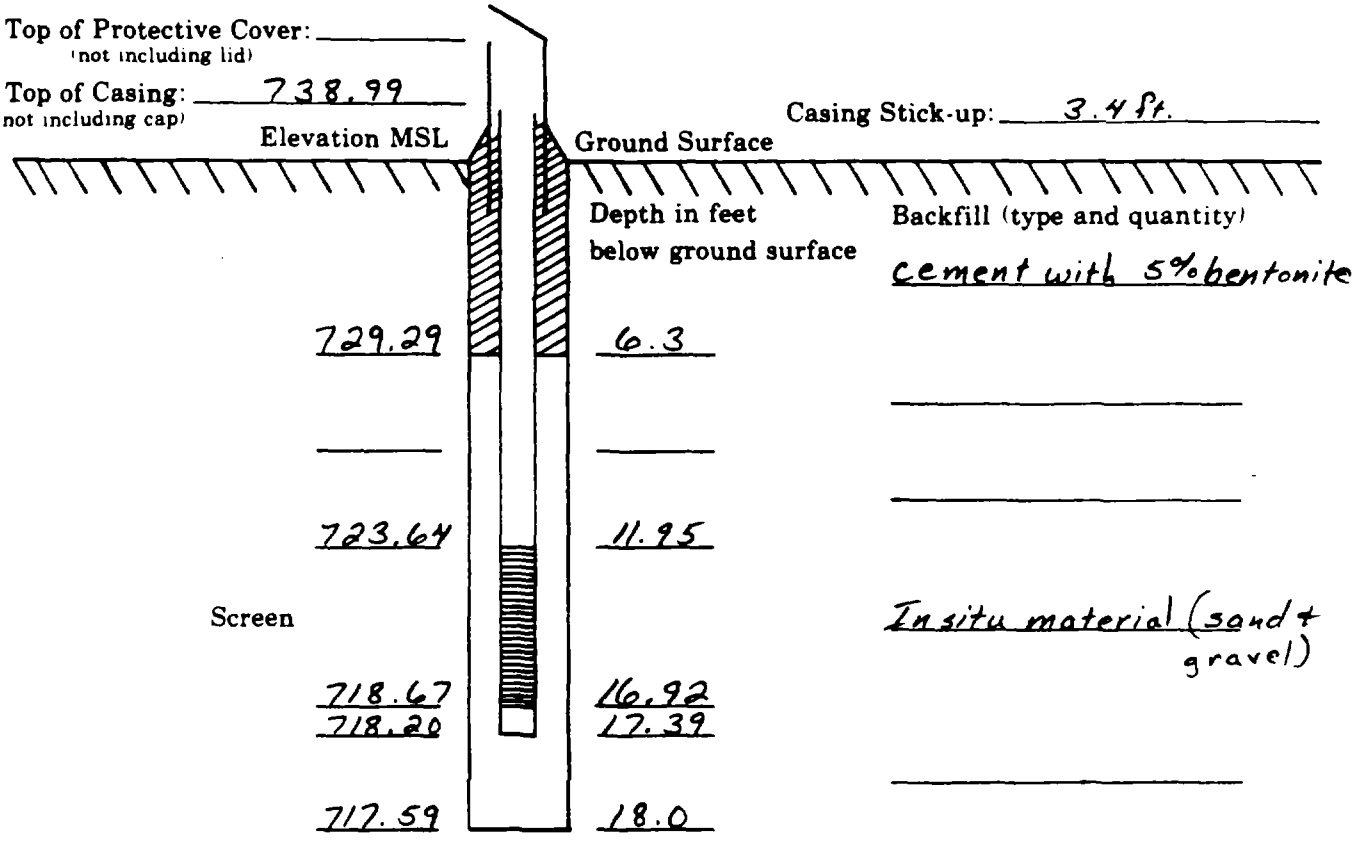
Monitor Well Location: Trull property SW of G104

Top of Protective Cover: _____ (not including lid)

Top of Casing: 738.99 (not including cap) Elevation MSL

Casing Stick-up: 3.4 ft.

Ground Surface



	Depth in feet below ground surface	Backfill (type and quantity)
729.29	6.3	cement with 5% bentonite
_____	_____	_____
723.64	11.95	_____
Screen		Insitu material (sand + gravel)
718.67	16.92	
718.20	17.39	_____
717.59	18.0	

Casing Type and Size: 316 stainless steel sched. 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen 0.47
top of screen 5.44
1st joint 5.60
15.63
20.79

Total Length of Casing 20.79 ft.

Plug (type) 316 stainless

Cap (type) _____

Protective Cover (type and size) 4"x5' with locking cap and padlock

teflon tape was used on all casing threads

Illinois Environmental Protection Agency **Monitor Well Construction**

County: Winnebago Boring No.: B-10

Site File Name: Rockton/Watts Ave. Groundwater Contam. Monitor Well No.: G-110

Site File No.: LPC 2010350003 Prepared By: S. Otto

Monitor Well Location Trull property SW of G-109

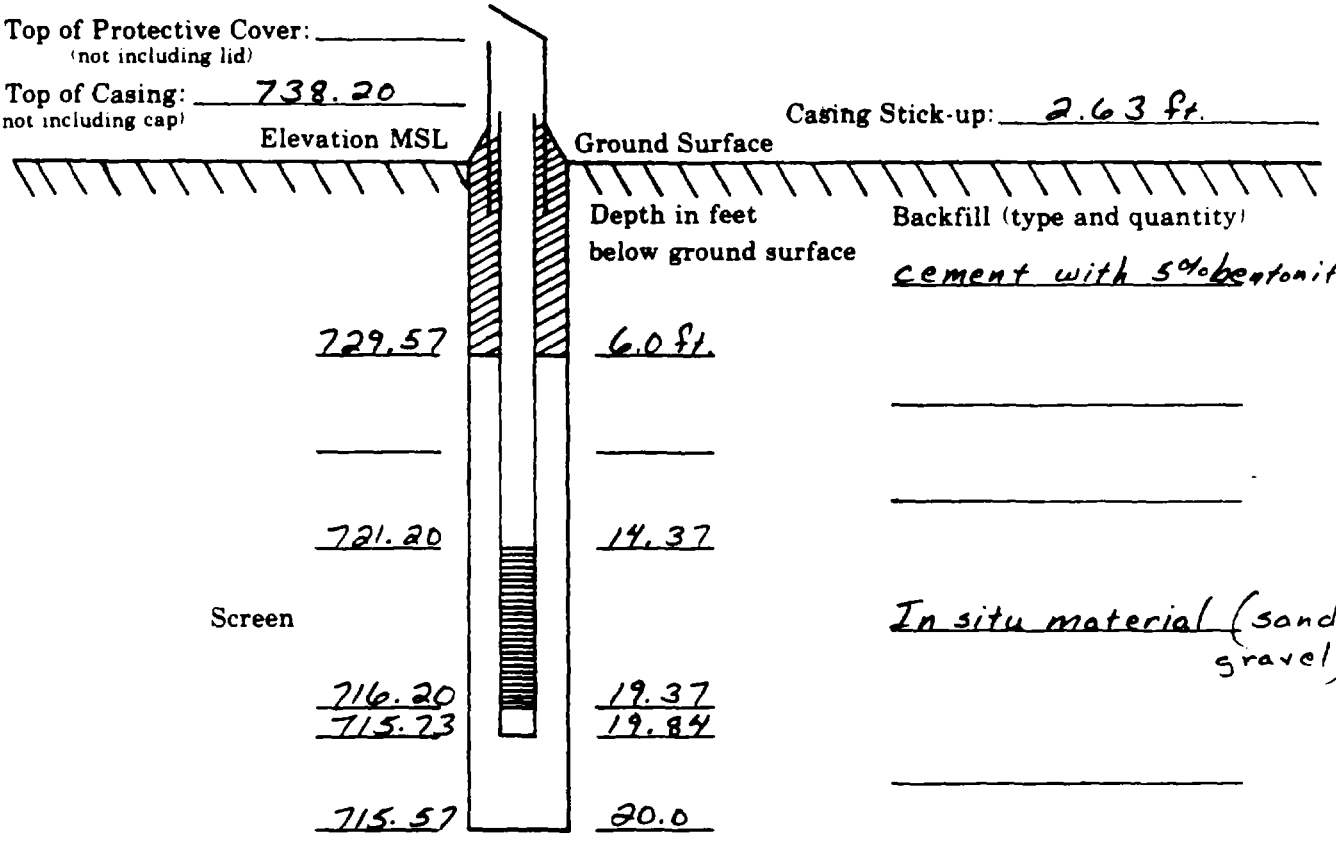
Top of Protective Cover: _____
(not including lid)

Top of Casing: 738.20
(not including cap)

Elevation MSL

Casing Stick-up: 2.63 ft.

Ground Surface



Depth in feet below ground surface	Backfill (type and quantity)
	cement with 5% bentonite
729.57 6.0 ft.	
721.20 14.37	
Screen	In situ material (sand + gravel)
716.20 19.37	
715.23 19.84	
715.57 20.0	

Casing Type and Size: 316 stainless steel sched. 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" ID (D)

Casing Field Measurements:

bottom of screen 0.47
top of screen 5.47
1st joint 5.80
15.81
17.82
22.47

Total Length of Casing 22.47 ft.

Plug (type) 316 stainless

Cap (type) _____

Protective Cover (type and size) 4"x5' with locking cap and padlock

teflon tape was used on all casing threads

Illinois Environmental Protection Agency — **Monitor Well Construction**

County: Winnebago — Boring No.: B-12

Site File Name: Rockton/Watts Ave. Groundwater Contam. — Monitor Well No.: G-108D

Site File No.: LPC 2010350003 — Prepared By: S. Otto

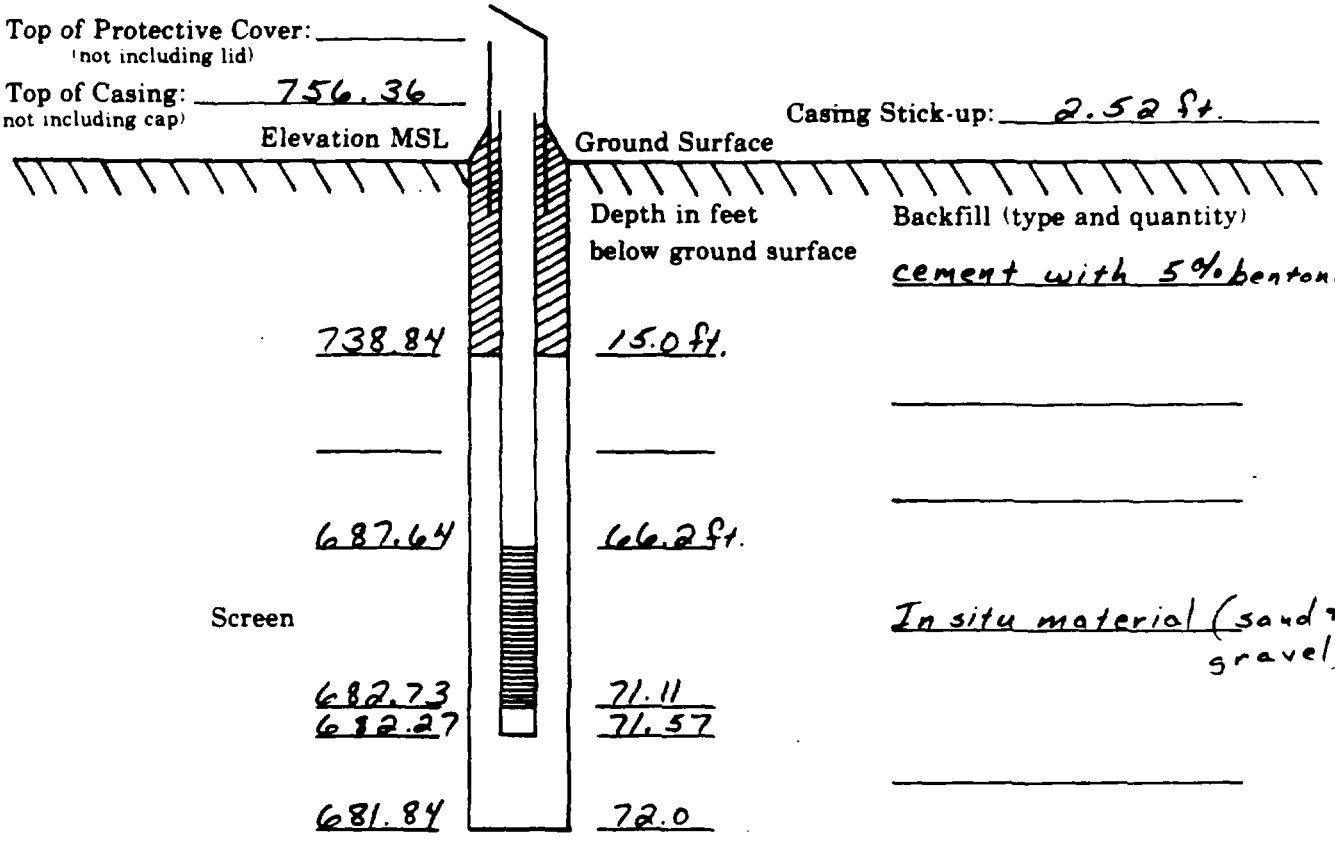
Monitor Well Location: Village Green Subdivision

Top of Protective Cover: _____ (not including lid)

Top of Casing: 756.36 (not including cap) Elevation MSL

Casing Stick-up: 2.52 ft.

Ground Surface



	Depth in feet below ground surface	Backfill (type and quantity)
		cement with 5% bentonite
738.84	15.0 ft.	
687.64	66.2 ft.	
Screen		In situ material (sand + gravel)
682.73	71.11	
682.27	71.57	
681.84	72.0	

Casing Type and Size: 316 stainless steel sched. 5 with sched. 40 threads 2" I.D.

Screen Type and Size: 316 stainless steel 0.01 slot 2" I.D. (D)

Casing Field Measurements:

bottom of screen 0.46
top of screen 5.37
1st joint 5.55
15.58
10.02
10.02
10.03
10.03 10.17
10.02

Total Length of Casing 74.09 ft.

Plug (type) 316 stainless

Cap (type) _____

Protective Cover (type and size) 4"x5' with locking cap and padlock

teflon tape was used on all casing threads.

APPENDIX E

WELL INDEX FOR WELLS USED IN

GEOLOGIC CROSS-SECTION

WELL

1) Amwood Homes, Permit No. 92126, Dated November 6, 1981.

FORMATIONS	TOP	DEPTH TO BOTTOM
Top Soil	0	4
Gravel	4	21
Sand, Clay	21	40
Yellow Limestone	40	125

WELL

2) Rockton Area Community Health Center
Permit No. 75194, Date June, 1978

FORMATIONS	THICKNESS	DEPTH TO BOTTOM
Soil	2	2
Sand & Gravel	38	40
Clay	40	80
Sandy Gravel & Clay	10	90
Clay & Gravel	20	110
Clay	110	220
Clay & Gravel	20	240
Sandstone	40	280

WELL

3) 409 Dingman Drive, Permit No. 57131
Date February 25, 1977

FORMATIONS	THICKNESS	DEPTH TO BOTTOM
Soil	2	2
Sand & Gravel	42	44
Sand	16	60

WELL
4) Illinois Environmental Protection Agency
Monitor Well No. G108D

WELL
5) City of Rockton #1, Permit No. 27475
Date July 1956

FORMATIONS	TOP	DEPTH TO BOTTOM
Top Soil	0	1
Coarse Sand & Gravel	1	20
Fine Sand	20	42
Coarse Sand & Gravel	42	120
Limestone	120	--

WELL
6) Rockton Township, Permit No. 59390
Dated April 26, 1977

FORMATIONS	THICKNESS	DEPTH TO BOTTOM
Sand & Gravel	70	70
Sand	12	82

WELL
7) Village of Rockton #6, Permit No. 6291
Dated 1968

FORMATIONS	THICKNESS	DEPTH TO BOTTOM
Glacial Drift	45	45
Galena Platteville Dolo.	105	150
St. Peter Sandstone	165	315
Fran Cowian Dolo.	235	550
Galesville Sandstone	178	728